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Alcohol Ignition Interlock Use Rates Following Changes in Interlock Legislation

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<p>Ignition interlocks are effective at preventing driving under the influence (DUI) of alcohol while installed on vehicles. However, the rate of interlock use is low relative to the numbers of DUI arrests and convictions, even in States that mandate interlock use for all DUI offenders. Accordingly, there is interest in identifying ways to increase interlock use, including by expanding the types of offenses for which an offender is eligible or required to use an interlock. This study examined how changes to interlock law affected interlock use in Florida and West Virginia. Each State had expanded the types of DUI offenses that result in mandatory or voluntary use of an interlock. The study compared the number of new interlock installations, interlocks-in-place (interlocks currently installed), installations as a proportion of those eligible to use interlocks, and lack of use or low use of the vehicles with interlocks, before and after the States modified their laws. The analyses found statistically significant increases in interlock use in both States after changes were made to their interlock laws. The Florida data showed increases of 21.8 percent in all DUI offenders mandated to install; 69 percent in first offenders mandated to install; 122.3 percent more installations overall; and 27.8 percent more installations for first offenders mandated to install. The West Virginia data showed an increase of 242 percent in interlock installations after a 2010 change in the interlock law, and an increase of 60 percent after a 2014 change to interlock law; however, the measure "interlocks-in-place" did not reveal changes, which may be due to limitations in the data used to capture the number of installations and removals. The results showed an increase in interlock installations after changes to DUI law expanded the types of DUI offenses, such as a "high-BAC" offense, that mandate or permit as an alternative sanction, interlock use. This outcome, though not surprising, suggests that previously some offenders avoided enrolling in interlock programs. Results also showed that barriers to interlock use can emerge when the law requires that offenders fulfill obligations unrelated to their DUI charge to qualify for interlocks program, such as paying past fines or child support. Finally, the study highlights the importance of interlock data systems for States to track trends in interlock use and evaluate interlock programs.</p>					
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List of Acronyms

AR	autoregressive
ARIMA	autoregressive integrated moving average
CDC	Centers for Disease Control and Prevention
BAC	blood alcohol concentration
DHSMV	Department of Highway Safety and Motor Vehicles
DMV	Division of Motor Vehicles
DUI	driving under the influence
DWI	driving while intoxicated
GHSA	Governors Highway Safety Association
GHSP	Governor's Highway Safety Program
MA	moving average
MADD	Mothers Against Drunk Driving
PIRE	Pacific Institute for Research and Evaluation
SB	Senate Bill
SCRAM	secure continuous remote alcohol monitoring
SES	socioeconomic status
SPSS	Statistical Package for the Social Sciences (trademarked software program)

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Executive Summary

Alcohol Ignition Interlock Devices

A breath alcohol ignition interlock device is a breath-testing unit mounted on or near the vehicle dashboard and connected to a vehicle's ignition. The interlock prevents the vehicle from starting unless the driver provides a breath sample into the device and the sample shows the driver's blood alcohol concentration to be lower than a predetermined level. Interlocks, while installed, are effective at reducing recidivism for impaired driving violations. Every State, Puerto Rico and the District of Columbia allow or require interlocks on the vehicles of some convicted impaired driving offenders. Regardless of their known effectiveness, interlock use remains relatively low when compared to the number of DUI arrests. Changing interlock-related legislation is one strategy for increasing interlock use.

Objective

The objective of this study was to examine the relationship between changes in interlock law and interlock use. The study compared the extent of interlock use before and after changes to interlock laws were enacted in Florida and West Virginia.

Interlock Effectiveness

There is substantial evidence that interlocks reduce impaired driving recidivism among drivers convicted of driving under the influence, or driving while impaired from alcohol, while installed in their vehicles. A meta-analysis of 15 studies found the relative risk of recidivism to be 0.36 for offenders in interlock programs, compared to offenders given more traditional sanctions (95% confidence interval 0.21-0.63) (Willis et al., 2004). A subsequent meta-analysis, which included 11 studies from the Willis et al. analysis plus four additional studies, found similar results (Elder et al., 2011). These studies showed no reduction in recidivism after the interlock was removed; nor did another review of 17 studies, even among offenders who were in interlock programs that had educational and treatment components (Blais et al., 2013). More recently, a study found that a group of offenders in an interlock program that included treatment for alcohol use disorder experienced 32 percent lower recidivism following the removal of the interlock (Voas et al., 2016).

Support for Interlocks

There is widespread support among policy makers and traffic safety advocates for interlocks as an impaired driving countermeasure. Every State, the District of Columbia, and Puerto Rico have interlock legislation that requires or permits the use of interlocks as a sanction for being arrested and/or convicted of DUI.¹ As evidence for the effectiveness of interlocks to reduce alcohol-impaired driving continued to grow, an increasing number of jurisdictions replaced at least a portion of the license suspension penalty with a requirement to enroll in an interlock program.

¹ NHTSA's *Digest of Impaired Driving and Selected Beverage Control Laws* reports the status of State laws concerning impaired-driving offenses and alcoholic beverage control (NHTSA, 2017). The website of the National Conference of State Legislatures also provides information on ignition interlock laws by State, the District of Columbia, and Puerto Rico.

Alcohol Interlock Use Rates

Early studies showed low rates of interlock use relative to the number of DUI arrests and convictions, such as 3 percent among second offenders in West Virginia (Tippetts & Voas, 1998) and 4 percent of all offenders in Wisconsin (Simpson et al., 1996). Interlock use has increased since then; a 2014 estimate found a range of 15 to 20 percent across the Nation (Government Accountability Office, 2014), and a 2016 survey of interlock programs found increases in the percentage of interlocks installed per DUI arrest in many of the eighteen States that had provided interlock and arrest data. For example, the 2016 survey reports an installation rate of 45.2 percent per arrest in West Virginia (Casanova-Powell et al., 2017).

Laws and Policies that Increase Interlock Use

Examples of laws and policies that potentially increase interlock use include those that:

- Increase the number of offenders eligible for interlocks—for example, by including first offenders;
- Assign interlocks through divisions of motor vehicles, rather than the judicial system;²
- Require interlocks as a condition for posting a bond at the time of arrest;
- Require interlocks for “hardship” or “limited” licenses; and,
- Impound a vehicle at arrest and release it only after an interlock is installed.

Methodology

The approach to this project was to identify a State that had recently implemented a change in alcohol interlock policy or law, and was willing to share data for this study; analyze the data to examine the effects of the strategy on the number and rate of interlocks assigned and used by DUI offenders; and, identify lessons learned in the deployment of the strategy.

Site Selection

We identified States that had implemented new laws or other changes to their interlock programs that would likely increase the use of interlocks. After reviewing laws across numerous States, and contacting several States, we selected Florida and West Virginia because they used two different types of strategies, could provide data for the study, and expressed interest in participating.

Quantitative Analyses

To understand changes in interlock use, we relied on archival data from interlock vendors and State agencies. We sought data archived before and after implementation of each legal change. The analyses were limited by the data available. We considered the following measures of interlock use:

² Interlock programs vary across jurisdictions; each State developed its program in accordance with its impaired driving law. In general, there are three types of interlock programs: administrative, judicial, or a hybrid of the two (Mayer, 2014). An administrative program is license-based and managed by state licensing agency (the department of motor vehicles); installing an interlock is a condition of licensing for a suspended driver or license reinstatement. A judicial program is one court-based in which the courts mandate interlock use, either pre-trial or post-conviction. A hybrid program combines features of both administrative and judicial programs.

- *Installations*—The number of instances in which an interlock was newly installed on a vehicle.
- *Interlocks-in-Place*—The number of interlocks that are currently installed in vehicles at a given time. Other studies used the term “interlocks-in-use.” However, we chose not to use that term because some vehicles with an “interlock-in-place” are not in fact driven. Furthermore, the data available on “interlocks-in-use” was problematic. The measure requires information on the number of new installations, and the number of removals of interlocks, on a rolling basis. The structure of the data files did not permit a reliable assessment, as the counts of new installations and removals were not in sync.
- *Installations as a Proportion of Those Eligible*—A measure that accounts for overall changes in DUI rates.
- *Lack-of-Use*—A measure of the extent to which interlock-equipped vehicles were not used frequently or at all, derived from interlock log data on the numbers of vehicle starts or mileage driven.

Results

Florida

In Florida, a DUI first offender with a BAC above a certain level is considered a “high-BAC” first offender who must install an interlock. The focus of the Florida case study was a 2008 law that reduced the “high-BAC” threshold from .20 g/dL to .15 g/dL.

The analysis found statistically significant post-intervention increases in the number of DUI first offenders who were mandated to install interlocks (+69 %); the number of DUI first offenders who installed interlocks (+27.8 %); the number of DUI offenders who were mandated to install interlocks (+21.8%); and the number of DUI offenders who installed interlocks (+12.3 %). In contrast, the analysis of interlocks-in-place data did not show a change post-intervention. This result may derive from the law affecting the likelihood that first offenders would be mandated to use interlocks. At the same time, first offenders are likely to be required to use interlocks for shorter times than are repeat offenders, thereby, reducing the number of interlocks-in-place. This could also be a result of the structure of the data files which did not sync new installations and interlock deinstallations.

Lack-of-use in Florida was examined using three measures: (a) the count of reports of low use, (b) the count of interlocks installed and in use (as calculated from interlocks-in-place minus reported low use), and (c) as a proportion of interlocks-in-place. None showed a significant change in lack-of-use after the 2008 intervention.

While the 2008 law was followed by an increase in the number of offenders eligible for interlocks, that was not its intended purpose. Its intention was to lower a high-BAC threshold believed to be too high; the 2008 law reduced the threshold for high-BAC first offenses from .20 g/dL to .15 g/dL. The purpose of the law was not to deploy a strategy for increasing interlock use overall, but to address the .20 high-BAC threshold.

West Virginia

We acquired data that allowed us to examine multiple interlock-related laws in West Virginia. The focus of the West Virginia study was Senate Bill 434, a 2014 law that allows offenders to

avoid a driver's license revocation, also called a "hard" revocation, in exchange for installing interlocks and waiving the right to an administrative hearing. To the extent possible, we also evaluated the effects of a 2008 law that created an aggravated (high-BAC) DUI offense, which required an interlock and reduced hard revocation periods for voluntary interlock users; and SB 186, a 2010 law that allowed the expungement of criminal charges for first-offense (except high-BAC) offenders who completed an ignition interlock program.

In West Virginia, the autoregressive integrated moving average model indicated a 242 percent increase in installations following the implementation of the 2010 law ($b=1.229$; $t=8.33$; $p<.001$) and a 60 percent increase following the 2014 law ($b=0.468$; $t=3.28$; $p<.001$). Regarding interlocks-in-place, we did not find a significant increase in interlocks-in-place after implementation of the 2014 law.

We examined the effects of the 2014 law changes on lack-of-use with data from two interlock vendors. Data from one of the vendors also allowed us to look at the effects of SB 535 in June 2008 and SB 186 in June 2010. The only significant effect seen was after the 2008 law, which resulted in a 60.3 percent reduction in lack-of-use. This may be due to an influx of first offenders entering a program that previously had been voluntary for first offenders but mandatory for multiple offenders.

While West Virginia's SB 434 could have been expected to increase the use of interlocks beginning in 2014, one of its goals was to decrease the misuse of the administrative hearing process by offenders to delay license revocation. In this regard, requests for hearings dropped about 50 percent after the law was implemented.

Conclusions

The data analyses found increases in interlock use in Florida and West Virginia after implementation of the interlock laws. The number of interlocks-in-place did not show significant changes in interlock use in either State, but this may have been due to a limitation of the data. The findings reveal there was an increase in interlock installations following changes in the DUI laws in each State. This result is not too surprising, considering key changes in the laws were expansions in the types of DUI offenses that mandated or allowed enrollment in an interlock program (and interlock use). Although the result is expected, it is worth noting, as interlock use has been historically low and many offenders have avoided enrolling in interlock programs regardless of a mandate to install. The study also found that barriers to interlock use arose when eligibility to enroll in an interlock program is connected to meeting obligations unrelated to DUI charges, such as paying past fines, taxes, or child support. Finally, the study highlights the importance of interlock data systems to states interested in tracking trends in interlock use and evaluating offender performance in interlock programs.

Introduction

A breath alcohol ignition interlock device is a breath-testing unit mounted on or near a vehicle's dashboard and connected to the ignition. The interlock prevents the vehicle from starting unless the driver provides a breath sample into the device, and the sample shows the driver's blood alcohol level to be lower than a predetermined level. Every State, Puerto Rico, and the District of Columbia allow or require interlocks to be installed on the vehicles of some convicted impaired driving offenders. Interlocks, while installed on the vehicles, are effective at reducing recidivism for impaired driving violations.

In some jurisdictions, the assignment of an interlock is mandatory for some types of offenses, such as for a repeat offense or for an offender one who had a high-BAC. All States, Puerto Rico and the District of Columbia allow courts to assign interlocks at their discretion. In some States, an interlock is required as a condition for obtaining an occupational or hardship driver license, and some persons arrested for impaired driving can volunteer to use interlocks in return for a reduction or dismissal of their charges.

Alcohol Interlock Effectiveness

There is substantial evidence that interlocks are effective at reducing impaired driving recidivism while installed in the vehicles of drivers convicted of driving under the influence of alcohol. In a meta-analysis of 15 studies, Willis et al. (2004) found that the relative risk of recidivism was 0.36 as compared to a group given more traditional sanctions (95% confidence interval 0.21-0.63) while the interlock was on the offender's vehicle. A more recent meta-analysis, which included 11 studies from the Willis et al. analysis plus four subsequent studies, found similar results (Elder et al., 2011). These studies showed no reduction in recidivism after the interlock was removed. Blais et al. (2013) reviewed 17 studies and found no reduction in recidivism after removal of the interlock. They also found that interlock programs with education and treatment components did not have lower recidivism rates than interlock only programs. In contrast, a Florida study showed that offenders with multiple lockouts for breath test violations who received additional treatment experienced 32 percent lower recidivism following removal of the interlock during the 12 to 48 months they were compared with the nontreatment group (Voas et al., 2016).

Support for Interlocks

The evidence for the effectiveness of interlocks has led to a national trend—replacing at least a portion of the traditional license suspension penalty for the DUI offense with a period on the interlock. Mothers Against Drunk Driving has supported mandating time on the interlock for all DUI offenders. The National Highway Traffic Safety Administration has funded numerous research studies related to interlocks, and provides technical support to State interlock programs. The Fixing America's Surface Transportation (FAST) Act (P.L. 114-94) includes ignition interlocks as one of the nation's priority safety programs, allowing States that mandate interlocks for all DUI/DWI offenders for at least 6 months to apply for grant funds to support their interlock programs (NHTSA, 2017). That legislation also removed the Federal requirement that States maintain a minimum period of license suspension prior to allowing offenders to install interlocks and provided a specific program for funding State interlock programs. The Government Accountability Office (2014) assessed interlock programs and concluded that interlocks “effectively reduce the rate of rearrests for driving while intoxicated (DUI) when installed.”

Interlock Use Rates

A significant factor limiting the more widespread use of interlocks is that they must be installed in a motor vehicle. This requirement enables some offenders to avoid the application of this sanction because courts cannot mandate them for drivers without vehicles. Since DUI offenders resist installing the units, opting instead to accept license suspensions, low installation rates have been reported by many interlock studies.

Early examples of low installation rates include 3 percent among second offenders in West Virginia (Tippetts & Voas, 1998), 2 percent of second offenders in Michigan, 1 percent of second offenders in Nebraska, and 4 percent of all offenders in Wisconsin (Simpson et al., 1996). Among the 16 studies in the Elder et al. (2011) meta-analysis for which data on eligibility was available, the reported participation rates varied dramatically from less than 1 to 64 percent with a median of 13 percent. Interlock use has increased since then; a 2014 estimate found a range of 15 to 20 percent across the Nation (Government Accountability Office, 2014), and a 2016 survey of interlock programs found increases in the percentage of interlocks installed per DUI arrest in many of the 18 States that had provided interlock and arrest data. For example, the 2016 survey reports an installation rate of 45.2 percent per arrest in West Virginia (Casanova-Powell et al., 2017). A 2018 report by Robertson et al. reported that percentages of interlock installations per arrests for interlock-eligible offenses were 17.5 percent, 20.6 percent, and 31.8 percent in 2015, 2016, and 2017, respectively. Of those convicted of interlock-eligible offenses, the percentages were higher, 35.3 percent, 41.7 percent, and 46.9 percent, respectively.

Several studies have reported higher participation rates, but they appear to represent special cases. Beck et al. (1999) found that 55 percent of a group of DUI offenders in Maryland who were offered the opportunity to install interlocks did so, but these were multiple offenders who had petitioned for driver license reinstatement and had gone through a rigorous examination process and, in some cases treatment programs, to qualify for the program. Despite that effort, 45 percent declined to install when given the opportunity and remained suspended. Voas et al. (2012; 2013) reported that 95 percent of DUI offenders in Florida who qualified for reinstatement installed interlocks, but noted that those who qualified constituted only about 50 percent of those who were subject to the interlock requirement. This is largely because qualification required offenders to pay all fines and to satisfy treatment requirements before they could apply for reinstatement.

Incentives/Disincentives to the Use of Interlocks

In considering methods for increasing the use of interlocks with DUI offenders, it is important to recognize that individuals convicted of impaired driving have had considerable ability to avoid the application of sanctions. This has been particularly true of the most widely used sanction—license suspension—since it is difficult to enforce on crowded U.S. roadways. For example, it has been estimated that about 5 percent of California drivers (approximately 1 million drivers) are unlicensed (DeYoung, 1997). In an observational study of suspended drinking drivers in two communities, McCartt et al. (2002) found driving-while-suspended rates of 88 percent and 36 percent. Higher rates were in the community in which drivers had more troubled driving histories. Other examples of disincentives are fines and the costs of treatment, when those must be paid before interlocks can be installed. Even the assignment of a jail sentence can be influenced by the offender because it interferes with employment and thus can be argued that it presents a hardship to the family. The interlock provides a special opportunity for offenders to

avoid the sanction by the requirement to install the unit on a vehicle: they can nullify the mandate by avoiding ownership of a vehicle.

Given this ability of offenders to manipulate the criminal justice system, it is important to understand the factors that influence decisions to install an interlock and to devise methods for motivating them to accept interlocks. Prior research into impaired driving and interlock issues conducted by research staff suggests several factors that commonly influence offenders' acceptance of interlocks. These include:

- The extent to which they need to drive,
- The availability of alternatives to driving,
- The ability to do job-related driving without an interlock,
- Willingness to drive illicitly,
- Financial and non-financial costs of the interlock, and
- Legal and administrative incentives to use the interlock.

The following constitutes a description of factors considered more fully for this research project:

Need to Drive—Offenders' need to drive generally falls into three categories: driving for (a) one's employment, (b) family commitments, and (c) the maintenance of personal lifestyle. The potential importance of the vehicle to maintaining employment and supporting family members has been specifically recognized by State legislation that allows interlock users to drive non-interlock-equipped cars provided by employers. Aside from employment, the need to drive children to school, medical facilities, and other family-related activities is an important factor in motivating the maintenance of driving privileges. Finally, less well recognized, but perhaps exerting a powerful effect on the decision to install an interlock, is the preservation of lifestyle activities such as driving to sporting events, parties and social events, and recreational activities. These needs should help motivate offenders to choose interlocks over not driving. However, offenders frequently chose suspension rather than the interlock.

Alternatives to Driving—The need for a vehicle is influenced by the environment in which the offenders live. In urban areas, such as New York City, public transportation may be an attractive alternative to the expense of operating a vehicle. In other localities, bicycling and walking may be reasonable alternatives to driving. Some offenders may have the support of families and friends who can provide transportation that meets the individual's driving needs.

Job-Related Driving—Concern over protecting offenders' employment has resulted in special provisions that allow offenders to drive an employer's car. While formally restricted to on-the-job transportation, this can open the opportunity to use the vehicle for personal activities, reducing the incentive to install interlocks on personal vehicles.

Illicit Driving—Some offenders who choose to remain suspended will drive illicitly. Since the probability of detection is relatively low, this may be an appealing alternative because it avoids the disadvantages of using the interlock (e.g., costs, inconvenience).

Financial Costs of the Interlock—The cost of installing and paying periodic (such as monthly) fees for the interlock, generally about \$1,000 a year, is a disincentive for many offenders. This has resulted in providers making provisions in their fee system to support indigent offenders.

Some States (e.g., New Mexico) have established indigent funds to pay for interlock programs. There are also those costs necessary to reinstate a driver's license, without which installing an interlock would be pointless. Reinstatement generally requires proof of insurance, and insurance premiums for those convicted of DUI generally rise on the order of \$1,000 per year. In a State, such as Florida, in which the interlock is required for reinstatement, the offender may be required to pay fines, reinstatement fees, treatment fees, delinquent taxes, and child support, before applying for reinstatement and installation of the interlock.

Non-Financial Costs of the Interlock—These include the inconvenience of blowing into the unit each time the vehicle is started and periodically while driving; the personal embarrassment of having the device in the car and using it when transporting friends and family; and the concern that the unit will disrupt offenders' drinking and socializing patterns, particularly for those dependent on alcohol.

Legal and Administrative Incentives—To motivate interlock use, courts and motor vehicle departments have developed alternative sanctions that offenders may find even less desirable. These are mostly available to the judicial system, where courts are empowered to apply a variety of sanctions, including jail, for the impaired driving offense. The use of closely monitored house arrest as an alternative has been demonstrated to increase the percentage of offenders installing interlocks (Roth et al., 2009; Voas et al., 2001). In addition, courts can employ sanctions such as transdermal monitoring systems (e.g., SCRAM) and portable home breath testing units as alternatives to the interlock. Motor vehicle departments have fewer options for motivating installation. One that has been shown to be effective in increasing installation, from 10 to 20 percent up to 50 percent, is the requirement to install an interlock as a prerequisite to license reinstatement (Voas et al., 2013).

Laws and Policies that Increase Interlock Use

The amount of interlock use can be affected by changes in laws and policies. Examples include:

- Increasing the number of offenders eligible for interlocks—for example, by including first offenders among those eligible;
- Assigning interlocks administratively, that is, through the motor vehicle departments;
- Requiring interlocks as a condition for posting a bond at the time of arrest;
- Requiring interlocks for “hardship” licenses and subsidizing interlock costs; and,
- Impounding a vehicle at arrest and releasing it only after interlock is installed.

NHTSA, the Centers for Disease Control and Prevention, and the Governors Highway Safety Association sponsored an evaluation of State interlock programs in 28 States that examined eight interlock program elements or “keys” that have the potential to increase interlock use (Casanova-Powell et al., 2015). Two program elements were strongly associated with increased interlock use: (a) State laws that *require* interlock use or establish incentives for installation; and (b) monitoring interlock use to ensure that interlocks are installed and being driven by the DUI offender. Four program elements had moderate associations with increased interlock use: (a) strong penalties for failure to install the interlock, for breath test violations, and for driving a different vehicle (noting that the penalties should be swift, certain, and severe); (b) uniform implementation and enforcement across the State; (c) coordination among stakeholders (law

enforcement, prosecutors, judges, probation, licensing, alcohol treatment, and interlock vendors); and (d) education and training on interlock programs and procedures for stakeholders. Two other program elements were not associated with increased interlock use but are considered important to support a successful interlock program: (a) resources for adequate staff and program funding, plus financial assistance for offenders to install interlocks; and (b) an accurate record system to support determining eligibility for interlock, monitoring violations, and evaluating program effectiveness.

Project Objectives

The objectives of this project were to identify strategies deployed to increase the use of interlocks by individuals arrested and/or convicted of DUI, measure the effectiveness of these strategies, and summarize any identified lessons learned in the deployment of the strategies.

Project Approach

The approach to this project was to:

- Identify potential strategies to increase interlock use;
- Identify States that recently implemented one or more of these strategies or that planned to do so in the near term;
- Select up to two States for study, based on:
 - their ability to provide data such as interlock installations and removals, for use in identifying any changes in interlock use; and,
 - their willingness to participate in the study.

Research Questions

The research questions were to examine if the changes in legal strategy impacted the rate of interlock use, and to identify any lessons learned in the deployment of the law.

Factors Affecting Interlock Use

The factors that affect interlock use can be thought of as stages at which a potential user either proceeds to use or avoid an interlock. Several of these factors are described below:

Eligibility—Laws and policies define conditions of interlock eligibility for DUI offenders. Changes in those laws potentially increase the number of people eligible to use the interlock. Examples of laws that expand eligibility for interlocks include first-offender laws and laws that lower the blood alcohol concentration at which an offense is considered “high BAC” in States that require interlocks for high-BAC offenses. Understanding the effect of such legal changes requires comparing the numbers of DUI offenders who are considered eligible before and after the law.

Assignment—Judges in States that allow, or even require, them to mandate interlocks may nevertheless fail or choose not to assign them. A State that has an administrative requirement to install an interlock may have additional requirements that prevent or dissuade offenders from installing one. For example, a State may offer a limited license for interlock users but may also create barriers to acquiring that license, in the form of requirements to pay delinquent taxes,

child support, etc., before an interlock license can be obtained. The result might be an offender who would prefer to use an interlock but cannot get access to one. A study of a strategy to increase interlock use needs to examine the extent to which lack of actual assignments might interfere with that strategy. This is done by comparing increases in the numbers of eligible offenders to the numbers of interlock assignments.

Acceptance—There are ways to avoid using an interlock. Examples include transferring ownership of a vehicle so an offender can claim to not own a vehicle on which the interlock can be installed. To understand the extent to which a strategy results in an increase in acceptance of the interlock requires an examination of interlock installations before and after the strategy is implemented.

Use—After an interlock is installed, there is no guarantee that the offender is using that vehicle. Some States require offenders to prove minimal use of the interlock-equipped vehicle. To understand the extent to which a strategy resulted in increased interlock use requires an examination of the extent to which vehicles with interlocks are driven.

Site Selection

A first step in this project was to identify States that had recently implemented a policy or legal change to their interlock program that might result in an increased use of interlocks. Examples of the policy changes we considered are listed in Table 1. We selected Florida and West Virginia because they each implemented changes to their interlock laws.

Table 1. Strategies for Increasing the Number of Eligible DUI Offenders in Interlock Programs.

Strategy	Examples
Expand coverage	<ul style="list-style-type: none"> • Mandate interlocks for all DUI offenders • Mandate interlocks as part of administrative license suspension/revocation • Require installation as a prerequisite to posting bond • Require an interlock for DUI offenders receiving work-related “hardship” licenses • Impound the vehicle at the time of arrest and release it after an interlock is installed • Require interlocks for reinstating licenses
Incentivize interlocks by offering undesirable alternatives	<ul style="list-style-type: none"> • Require transdermal monitoring • Require home breath testing devices and twice-daily breath testing (as required by “24/7 Sobriety Programs”)

Strategy	Examples
Limit opportunities for offenders to use non-interlock vehicles	<ul style="list-style-type: none"> • Improve the enforcement of laws against unlicensed driving (e.g., with photo license recognition systems) • Repeal laws that permit offenders on interlocks to drive a company car without an interlock • Improve interstate compacts and use of the National Driver Register (to keep track of offenders who change State residence) • Check vehicle registrations of offenders who avoid interlocks by claiming not to have a car • Print interlock restrictions on driver’s licenses
Increase the attractiveness interlocks to offenders	<ul style="list-style-type: none"> • Allow offenders to avoid hard suspension • Increase available indigent funds • Reduce the non-driving costs of interlocks such as paying delinquent child support payments (which may incentivize offenders to drive unlicensed) • Reduce insurance costs for those on interlocks (using State high-risk-driver insurance pool funds) • Increase the convenience of interlocks (e.g., by collecting log data using mail-in units or electronic remote checking systems)
Increase the attractiveness of interlocks to judges and prosecutors	<ul style="list-style-type: none"> • Require interlocks with photo identification • Require interlocks with real-time reporting (for example, through cell phone technology) • Increase public acceptance of interlocks • Reduce government costs of monitoring by placing more responsibility on the interlock provider • Couple the interlock system with GPS (global positioning system) for closer monitoring of driving behavior (interlock and BAC monitoring)

Quantitative Analyses

To assess changes in interlock use, we sought data on the numbers of offenders eligible or mandated to install interlocks, and the numbers of offenders who installed interlocks; we also sought data on “low-use” vehicles with interlocks (those that had few starts or low mileage), and the numbers of new installations and removals of interlocks. Limitations of the data compromised the ability to use some measures. We sought the following measures:

Installations—The number of instances in which an interlock was newly installed on a vehicle.

Interlocks-in-Place—The number of interlocks installed in vehicles at a given time. Studies have used the term “interlocks-in-use” to describe this; however, we have chosen not to use that term because our operational model assumes that some “interlocks-in-place” on vehicles are not actually being used. This measures interlock uses differently than installations in that it includes the effects of strategies that involve changing the duration of time that an interlock is installed. For example, a law that increases the interlock period for some offenders would tend to increase the number of interlocks-in-place even if the number of installations remains the same. Both Florida and West Virginia have policies that extend interlock periods for non-compliance, but those policies did not go into effect in either State at a time when any effect would have

confounded the effects of the laws we were evaluating. It is also important to note that there were issues with the data files for this variable that undermined its utility in this analysis.

Installations as a Proportion of Those Eligible—This measure reflects the relationship or ratio between the number of installations and the number of DUI convictions. All things being equal, an increase in DUI arrests and convictions would result in an increase in interlock installations.

We conducted an analysis of the number of offenders mandated to install interlocks, and another analysis of the number of offenders who had installed interlocks. This approach was necessary because not all eligible offenders enrolled in an interlock program, for various reasons. For example, an offender who owed child support was required to pay child support before being allowed to have their license reinstated, a prerequisite to interlock program eligibility.

For our study of the West Virginia law, the analysis was limited to data on the annual numbers of DUI arrests, which allowed us to examine changes in installations as a proportion of arrests by year. (We did not have access to weekly or monthly data on DUI arrests or convictions, precluding the ability to conduct a time series analysis.)

Lack-of-use—Because an offender may install an interlock on one vehicle and use another, analysis of interlock use should include a measure of the extent that interlock-equipped vehicles are driven.

In Florida, there is a requirement that vendors notify the Department of Highway Safety and Motor Vehicles when data shows that an interlock user has driven the interlock-equipped vehicle fewer than 50 miles in the reporting period (normally 30 days). When interlock records show fewer than 50 miles, the DHSMV mails letters to the offenders notifying them of the vendor reports and reminding them that it is illegal to operate a vehicle that is not equipped with an interlock. Lack-of-use data in Florida is based on dates on which these letters were mailed. Weekly counts of lack-of-use were calculated from these dates.

Although West Virginia does not require vendors to report cases of suspected lack-of-use, we obtained data from the interlock providers on lack-of-use. We queried these historical interlock records for the number of vehicle starts per month per offender and produced files containing data on vehicles started fewer than 30 times per month. Although driving a vehicle fewer miles (Florida) or starting a vehicle fewer times (West Virginia) than the threshold is not proof that the offender is using another, non-interlock-equipped vehicle, we used this information as a measure of lack-of-use over time.

In each case, we relied on data supplied by the State's motor vehicle agency and interlock vendors. For Florida data, we used files provided by the Florida DHSMV. For the West Virginia analyses, we used files provided by the West Virginia DMV to analyze installations, and interlocks as a proportion of those eligible. Data on lack-of-use was provided by interlock vendors operating in West Virginia, and based on queries of vendor data to provide monthly counts of vehicles with fewer than 30 starts per month. All analyses for both States were performed using Statistical Package for the Social Sciences software, Version 20 or 21.

Case Study 1: Florida

Program History, Including Legislation

Key features of the Florida interlock program include the following.

- The administrative part of the program covers all levels of DUI offenders except for first-time offenders with arrest BACs below .15 g/dL. Before 2008 that level had been .20 g/dL. Offenders can also be ordered to use interlocks by the courts. In 2008 lowering the threshold for the “high-BAC” level from .20 to .15 was not unusual; other States had made similar changes, and highway safety grants incentivized the change. The change came out of discussions between stakeholders including the DHSMV, the courts, and the legislature. Some people believed that .20 (being about 2.5 times the illegal per se limit of .08) was too high and that .15 (a little less than double the illegal per se level) was more appropriate.
- Driver’s licenses of those convicted of DUI are revoked for varying periods depending on the number of prior DUIs and the gravity of the offense.
- Following the mandatory license revocation period, offenders may apply for reinstatement, if they have completed all court and DHSMV conditions (e.g., paid fines, attended treatment). Revocation periods vary by offense. For example, the first offense results in revocation from 180 days to 1 year with the possibility of a hardship license. For any offense involving serious bodily injury, including a first DUI offense, the revocation period is at least 3 years with a possibility of a hardship license. The second offense within 5 years from prior conviction will result in at least a 5-year revocation with the possibility of a hardship license after 1 year. A second DUI offense not within 5 years from prior conviction will result in a 180-day to 1-year revocation with no possibility of receiving a hardship license. Subsequent offenses result in longer revocation periods, depending in part on the time elapsed since the prior offense.
- Upon a successful application to the ignition interlock program, a driver’s license can be restored; however, it is restored with the limitation that the offender must drive an interlock-equipped vehicle for a specified period—generally 6 months for first DUI offenders; 1 year for second offenders.
- Drivers with revoked driver’s licenses cannot be reinstated without a period on the interlock. They cannot avoid interlock use by waiting until a certain period, such as a suspension period, has expired.
- Program violations result from two start-up fails within 4 hours, retest fail or refusal, or evidence of tampering or circumvention. Offenders with three or more violations are required to enter a treatment program and their time on the interlock is extended.
- Offenders who fail to qualify for reinstatement and complete the required time on the interlock remain revoked for life.

A brief history of the Florida interlock program is described as follows.

- 2004—Florida’s interlock program began. In the first two years participant numbers were low due in part to the buildup of the program. Before being eligible for

installation of the interlock, a first offense generally resulted in 3 to 6 months of license revocation, a second offense in 5 years resulted in 1 year of revocation, and a third offense in 10 years resulted in 2 years of revocation. Another factor resulting in low initial numbers was a limitation with the original law, which did not require offenders to install interlocks unless ordered by a court.

- 2005—Legislation that took effect in July 2005 addressed an earlier limitation by enabling the DHSMV to require interlock use for some types of offenses. However, numbers remained relatively low until 2007 because the new administrative rule applied to offenders who committed an offense after July 1, 2005, and those offenders had to complete a hard revocation period before they could install an interlock. The effect of those two factors can be seen in Figure 1, which shows the total interlock enrollment in each quarter (upper line) over the 10-year period from 2004 to 2013. The two lower lines show the number installing and de-installing in each quarter during that period. The hump in 2004 to 2005 in total enrollment was caused by the initial inclusion of offenders not mandated by the judges in those years, followed by a period when only those mandated by the judge entered the program. Initially, first offenders with an arrest BAC of .20 g/dL or higher were eligible for interlocks.
- 2008—In Florida, first offenders are eligible for the interlock if they are considered high-BAC offenders or their DUI case included child endangerment. In October 2008 a law lowered the BAC threshold for high-BAC offenses from .20 to .15 g/dL. Because this change expands the type of offenders eligible for interlock use, it is considered a strategy to increase interlock use for the purposes of this study. A sharp increase in interlock use beginning in 2008 is due partially to the increase in first offenders assigned to the interlock program. The two lower lines in Figure 1 indicate that approximately 2,500 offenders install interlocks and 2,500 offenders remove interlocks each quarter, resulting in relatively stable numbers of offenders in the program over time (approximately 10,500).

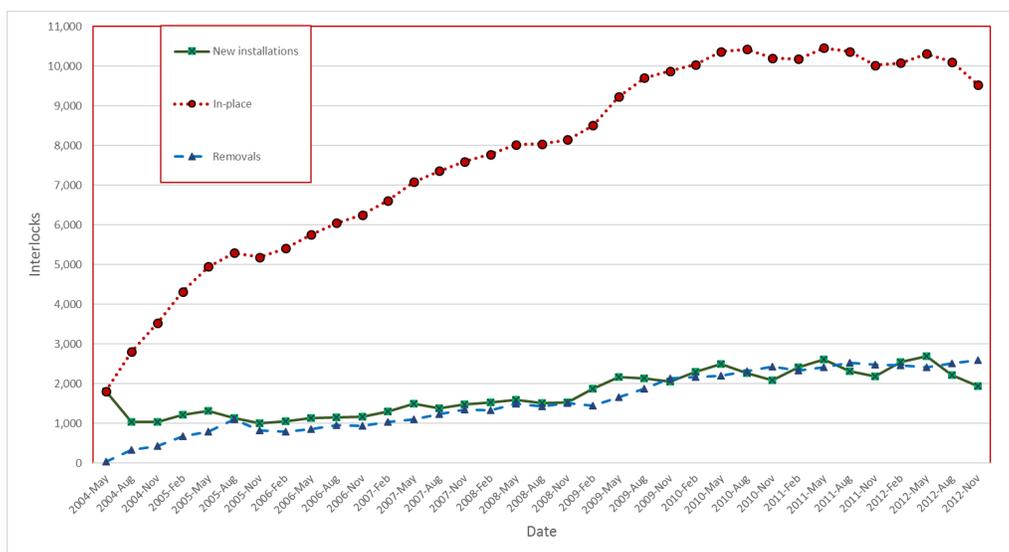


Figure 1. Changes in Number of Florida Interlock Installations, 2004–2012.

Figure 2 shows interlock participation from 2004 to 2012 by offender type.

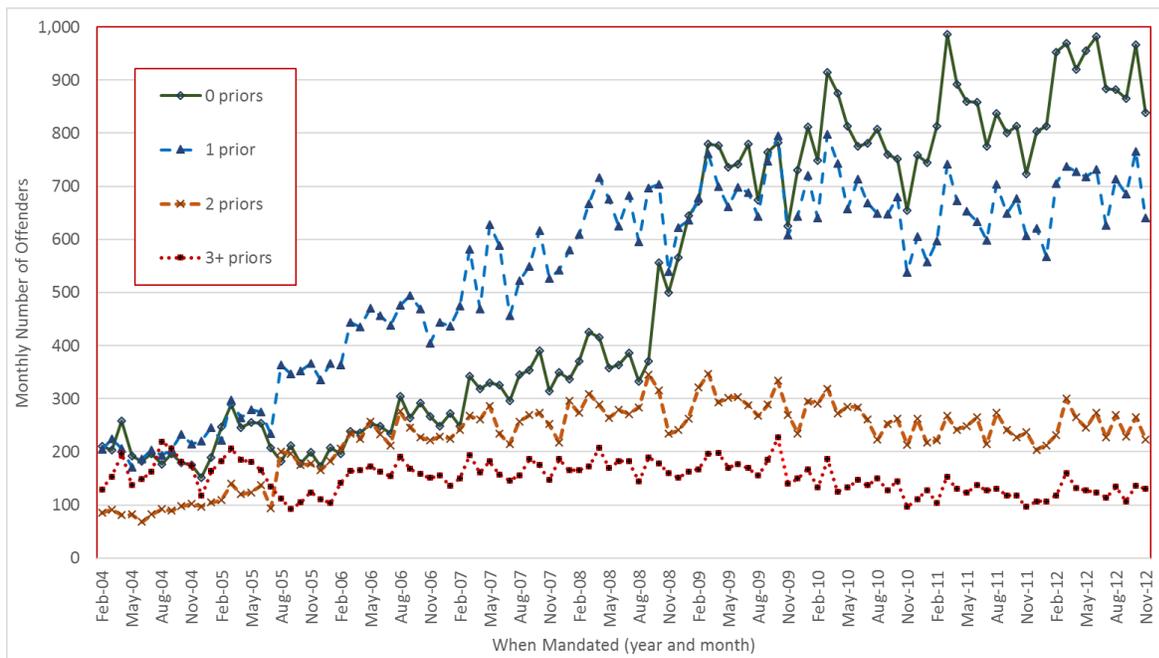


Figure 2. Changes in Number of Florida Interlock Installations, by Offense Type.

To understand the potential effects of the change in “high-BAC” thresholds, it is helpful to understand how large a proportion of DUI offenders fall into the high-BAC category. Unfortunately, data on the numbers of low-BAC first offenders and high-BAC first offenders are unavailable. However, we have data on the number of offenders who were administratively mandated to use interlocks,³ and their status as first offenders or multiple (second or subsequent) offenders. Any first offender mandated to use an interlock would have had a high BAC or endangered a child, but the latter accounts for a small number of cases. To understand the numbers of offenders affected by the change in the law, we compared the numbers of first and multiple offenders mandated to use interlocks before and after the law. The results are shown in Table 2. We examined data from the 4 fiscal years before the law (2005-2008) and found that the last 2 years (2007-2008) were sufficiently stable, in terms of the ratio of first-to-multiple offenders mandated, to be used for predicting future numbers of high-BAC offenders had the law not changed. Across those 2 years, about 34 percent of offenders mandated to install interlocks were first offenders. After the law, the ratios for the first 4 years were 60 percent, 70 percent, 81 percent, and 85 percent. Table 2 also shows the predicted number of first offenders with a BAC > .20 g/dL who would have been mandated using the higher threshold. We can estimate this number by applying the ratio from before the change in the law to the number of first offenders in each of the 4 years following the law. The bottom row in Table 2 shows the difference between the numbers predicted using the ratio associated the .20 g/dL threshold, and the actual

³ By law, this is all multiple offenders or high-BAC first offenders.

numbers with the new threshold of .15 g/dL—that is, the imputed additional high-BAC offenders created by lowering the BAC threshold. The total difference over the first 4 years is 20,499 mandated interlocks, an average of about 5,000 per year.

Table 2. Imputed Increase in High-BAC Offenders Post 2008.

	Mandated Fiscal Year (October–September)					
	2007	2008	2009	2010	2011	2012
Multiple offenses	10,890	12,974	13,614	13,428	12,064	12,480
First offense	3,640	4,413	8,191	9,425	9,729	10,562
Ratio of first to multiple offenses	.334	0.340	0.602	0.702	0.806	0.846
Predicted .20+ first offenders			4,594	4,531	4,071	4,211
Imputed first offenders at .150 to .199			3,597	4,894	5,658	6,351

Understanding Eligibility to Install Interlocks in Florida

To understand how overall rates of DUIs may have influenced changes in interlock use, it was necessary to conduct an analysis of interlock use as a proportion of those eligible, that is, the offenders who should be assigned interlocks according to the law. In the case of Florida, there are other requirements or criteria for using interlocks. While we use the word “eligible” in this report to refer to offenders required by law to install interlocks, Florida reserves the term to refer to people required by law *and* who have met certain other requirements for installing the interlock. These requirements include completing a mandatory suspension period, meeting the requirements for DUI classes and treatment, and paying the fees and fines associated with the DUI, and paying outstanding fines or fees due to the State (such as child support payments).

Figure 3 shows the various situations for an offender with respect to interlock installation, and the numbers of offenders in each situation in the data set. The rectangle at the top represents offenders mandated by law to install interlocks prior to license reinstatement. Of these, some had not completed their hard suspension period (Set 1a) and some had (Set 1b). Offenders in both Sets 1a and 1b are mandated, but they are not necessarily eligible. Of the offenders in Set 1b, about half had not met the requirements to be eligible for the interlock (2a) and half had (2b). It is likely that some members of Set 2a had not met eligibility requirements because they could not and some because they chose not to. The latter group can be considered offenders assigned interlocks who did not accept it. It is not possible to tell from the data how many members of Set 2a could not and how many would not install the interlock. Some offenders who were mandated to install could not install because they were either still under hard suspension (Set 1a) or because they did not meet interlock program eligibility requirements (Set 2a). Of those who met eligibility requirements, relatively few failed to install (3a). This may be because those who would choose not to install would do so before going through the effort and expense of meeting the requirements. For these reasons, we will refer to those as “mandated to install” rather than those who are “eligible” for the interlock. Rather than discussing installations as a proportion of those eligible to install, analyses will show pre-post changes in the numbers of those *mandated* to install and those who *actually installed* interlocks.

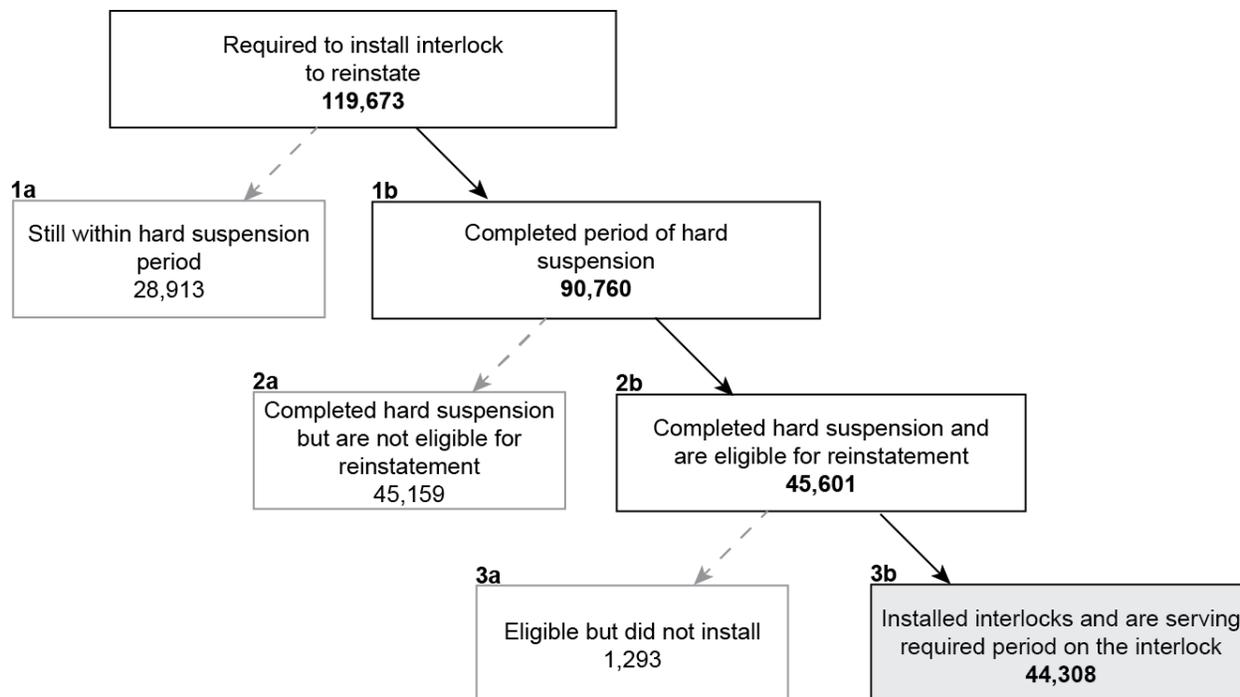


Figure 3. Status of DUI Offenders Required to Install Interlocks by Hard Suspension Period and Reinstatement of Driver’s License Relative to Interlock Installation.

Table 3 below shows the numbers of DUI arrests by year and the numbers and percentages of interlocks mandated, installed, and in place for 5 years before 2008 and 4 years after 2008. Offenders arrested in Florida for a DUI must serve a period of hard license suspension before being eligible to install interlocks. Depending on how many prior DUIs (and other severity factors) the offender has, this minimum hard suspension period is anywhere from 6 months to 10 years. The median is about a year. That means that someone arrested in 2007 would not get an interlock until, on average, 2008. Table 3, therefore, shows estimates of the percentage of mandated, installed, and in-use interlocks relative to the DUI arrests⁴ of the prior year. Because the number of interlocks-in-place changes daily, the values for interlocks-in-place is an estimate, based on the number of people with interlocks on their vehicle at any point within that calendar year.

⁴ Florida DUI arrests were obtained from www.fdle.state.fl.us/cms/FSAC/Documents/Excel/UCR_Arrest_Breakdown_County.aspx

Table 3. Number of DUI Arrests by Year, and Number and Percentage of Interlocks Mandated, Installed, and In Place, for 5 Years Before 2008 and 4 Years After 2008.

Year	DUI Arrests	Mandated		Installed		In Place	
		N	percent	N	percent	N	percent
2003	56,528	–	–	–	–	–	–
2004	55,325	9,787	17.3%	3,878	6.9%	3,878	6.9%
2005	57,210	9,720	17.6%	4,667	8.4%	7,763	14.0%
2006	54,890	12,885	22.5%	4,506	7.9%	8,874	15.5%
2007	58,358	15,255	27.8%	5,665	10.3%	10,990	20.0%
2008	61,354	18,162	31.1%	6,157	10.6%	12,537	21.5%
2009	52,735	22,577	36.8%	8,233	13.4%	15,326	25.0%
2010	51,913	22,391	42.5%	9,144	17.3%	17,745	33.6%
2011	43,563	21,948	42.3%	9,518	18.3%	18,593	35.8%
2012	44,697	22,995	52.8%	9,377	21.5%	18,711	43.0%

Description of the Interlock Data

The data used in these analyses consisted of three data sets provided by the State of Florida under a cooperative agreement between PIRE and the Florida State DHSMV. The first group of data is specific to the interlock program and contains data that pertain to being mandated, sentence length, eligibility to install, installation date, removal date, departmental action codes, and other items specific to the interlock program.

The second group of data files comes from the driver record systems, which includes information about the driver’s residence, licensing status and history, as well as all violations and other procedural events, some of which overlap with data in the more specific (and separate) interlock data files. The Florida DHSMV linked the records in these files by driver’s license number. We then imported these into SPSS for statistical analyses.

The third group of files provided by DHSMV contains dates on which letters were sent to offenders warning them of reported instances of lack-of-use—that is, instances in which an interlock data download indicated that the vehicle had been driven fewer than 50 miles. These were used to generate counts of lack-of-use by week from January 2007 to March 2012.

The first two groups of files were used to create a data set containing data for 152,000 offenders who had been mandated to install interlocks between the program’s initiation in 2003 and the end of December 2013. Of those 152,000 offenders, 63,800 had installed during that 10-year period. (Note that an extremely small percentage of these offenders includes repeat offenders who have gone through the interlock program more than once.)

For the time series analyses, a file was created that provides a count of certain event types (e.g., arrests, mandates, installations, removals, recidivism rearrests, etc.) within time windows (e.g., weekly, bimonthly, monthly, quarterly) that provide a relatively stable sampling of events per time unit, such that the variability of the time series is relatively low. The tradeoff is that time units that are too wide (e.g., quarterly) will result in a shorter series with fewer data points, which provides low statistical power, as the length of the series (number of time points) becomes the effective sample size. However, making the time unit too narrow (e.g., daily or weekly) to

have a longer time series with many data points can produce too much sampling error week-to-week, with the variability between data points becoming counterproductive to detecting the size of an intervention; this can become obscured by the intra-series noise. The optimal time window to use in aggregating a time series is not always apparent beforehand, and data diagnostics prior to analysis can help the statistician select the appropriate time unit to use. As we knew there would be sufficient cases within each weekly window, we used weekly time series in analyzing the impacts of the October 2008 intervention on installs.

Analyses

Effects of Strategy on Interlock Use

For the test of intervention effects coinciding with the implementation of the interlock program, as well as subsequent changes that could have impacted the program, we used ARIMA intervention time series models, the standard method for measuring the impact of a law or policy change on some measure. This statistical procedure is necessary for data that have a temporal nature (due to the autocorrelations over time, which violate standard statistical assumptions of independence), and models out these temporal dependencies via autoregressive and moving average model components. This procedure also accounts for any consistent trend or drift, called integration (the 'I' in ARIMA) via differencing. Periodicity, such as seasonality, was also modeled using seasonal parameters for AR and MA when necessary. Intervention parameters, usually modeled as step functions via dummy variables, and was then evaluated against the residual series once the ARIMA had been appropriately modeled.

For Florida, there was a single intervention point, tested as a dummy variable before and after October 2008, when the BAC for first DUI offenders was lowered from .20 to .15 g/dL. (All multiple offenders were mandated to the interlock from the beginning of the program in 2003, regardless of BAC.)

Results

Interlock Usage

Installations

Earlier we described the difference between those who are eligible to install interlocks and those who do install one. The following figures show ARIMA-based moving average estimates, titled the “seasonally smoothed” mandated averages, over time in the numbers of offenders mandated to use interlock and in actual numbers of installations. The solid vertical line shows the date of the law change, that is, the intervention studied. The vertical hashed lines represent single point variances to the ARIMA average, the “seasonally smoothed” best, to the actual number of offenders mandated to install interlocks, or the number of installs. Note that regular drops in the number of offenders mandated reflect seasonal changes. This seasonality is common to this type of data. We are not certain what causes it in this data, but it is likely due to seasonal changes in driving, likelihood to drive impaired, or administrative factors related to processing arrest data.

For *All DUI Offenders*, the number of offenders *mandated to use* interlocks increased by 21.8 percent when comparing the ARIMA “smoothed” average before and after the 2008 law. Two-tailed significance was $p = .006$. See Figure 4.

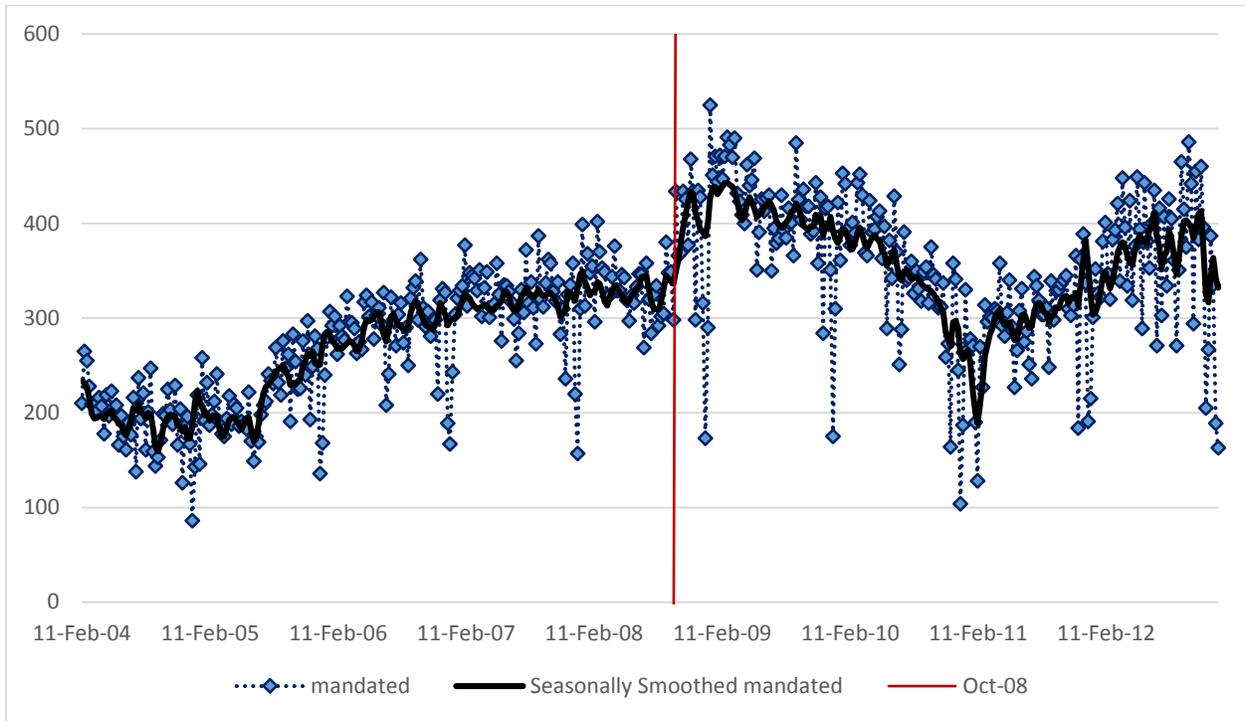


Figure 4. Florida: All Offenders *Mandated* to Use Interlocks.

For *All DUI Offenders*, the estimated average number of *installations* significantly increased by 12.3 percent following the law (one-tailed significance: $p = .039$). See Figure 5.

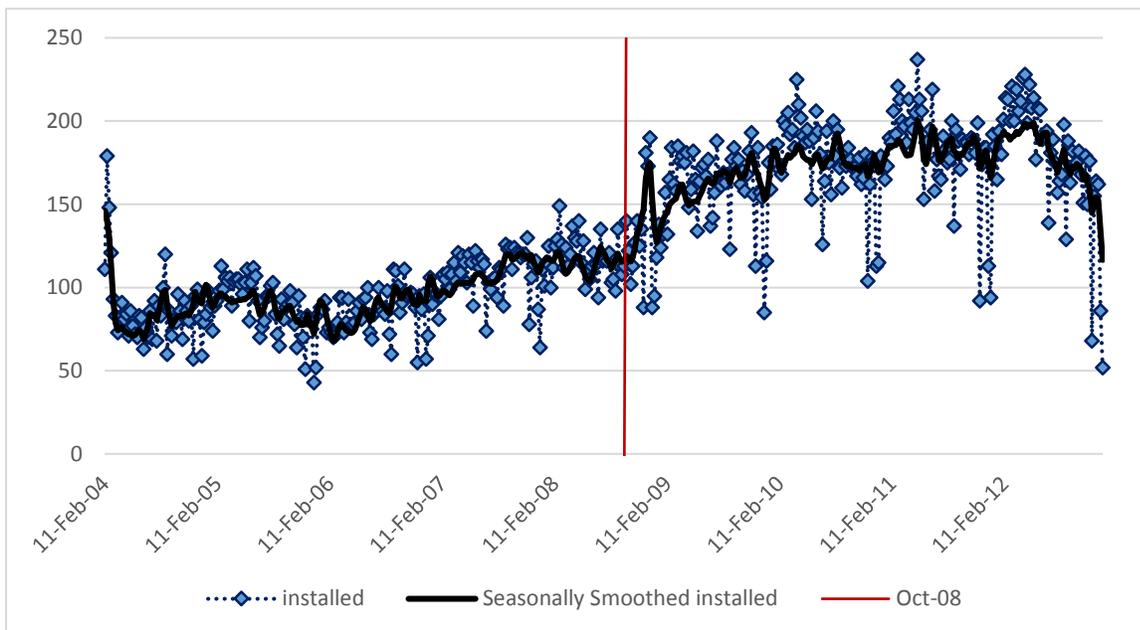


Figure 5. Florida: All Offenders *Installing* Interlocks Following the Law.

Because the intervention being studied was a law that applied to “high-BAC” first offenders, we further refined our analysis to see the effect on installations for first offenders only, improving on

the effects seen in Figures 4 and 5. For this series, results did not model as cleanly as they did for all offenders (perhaps due to smaller numbers), but with several different modelling approaches, we showed similar results (in terms of intervention effect size, significance levels, etc.). We are relatively confident about the reliability (non-spuriousness, i.e., results not being due to modelling artifacts) of these results. Using the alternative models, considering the *most conservative* effect sizes, for estimated average numbers of offenders mandated to use interlocks there was an increase of 69 percent after the law ($t = 6.56, p < .0001$). See Figure 6.

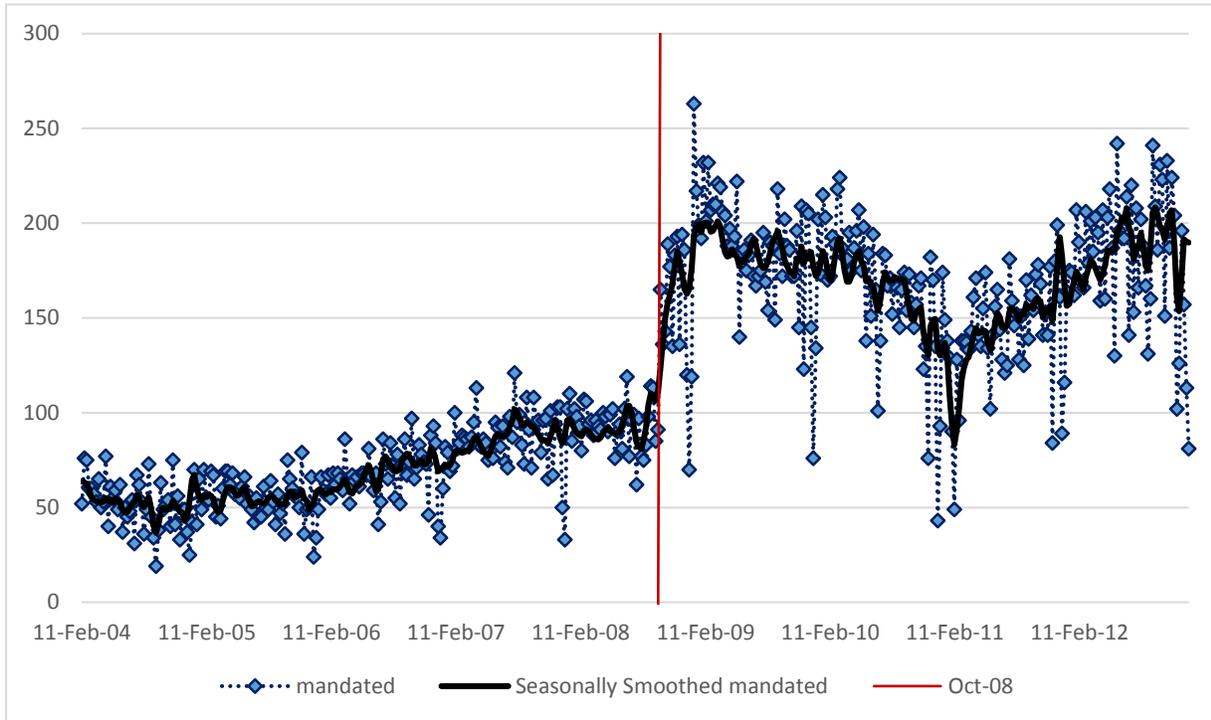


Figure 6. Florida: Number of First Offenders Mandated to Install Interlocks

For estimated average numbers of installations for first-time offenders, there was a significant increase of 27.8 percent ($t = 1.948$; $p = .026$). See Figure 7.

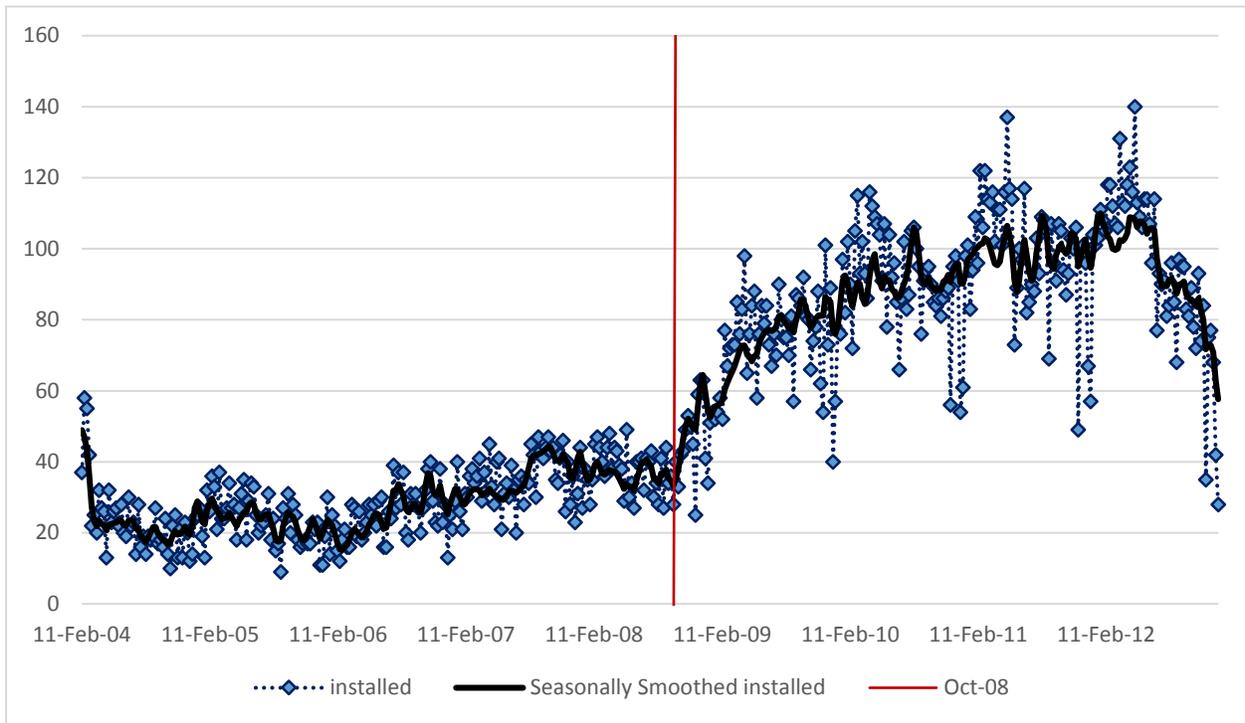


Figure 7. Florida: Number of First Offenders Installing Interlocks.

Interlocks-in-Place

This analysis presented several difficulties with the time series, in terms of finding an ARIMA model that performed satisfactorily. No models resulted in a significant intervention effect for the October 2008 law. In the most acceptable ARIMA models, the probability of statistical significance for the test was approximately $p = .700$, with the best showing $p = .694$.

Figure 8 shows a graph of Florida interlocks-in-place data. The vertical line is the intervention, namely, the October law. Early in the series there was anomalous data due to a court case that allowed some people to get their mandate overturned and be removed from the interlock program early. Filtering the time series to begin after that anomalous data made a big difference in achieving a satisfactory ARIMA model fit. Ultimately, the best fit model resulted in a non-significant increase in interlock use of 0.32 percent ($p = .694$).

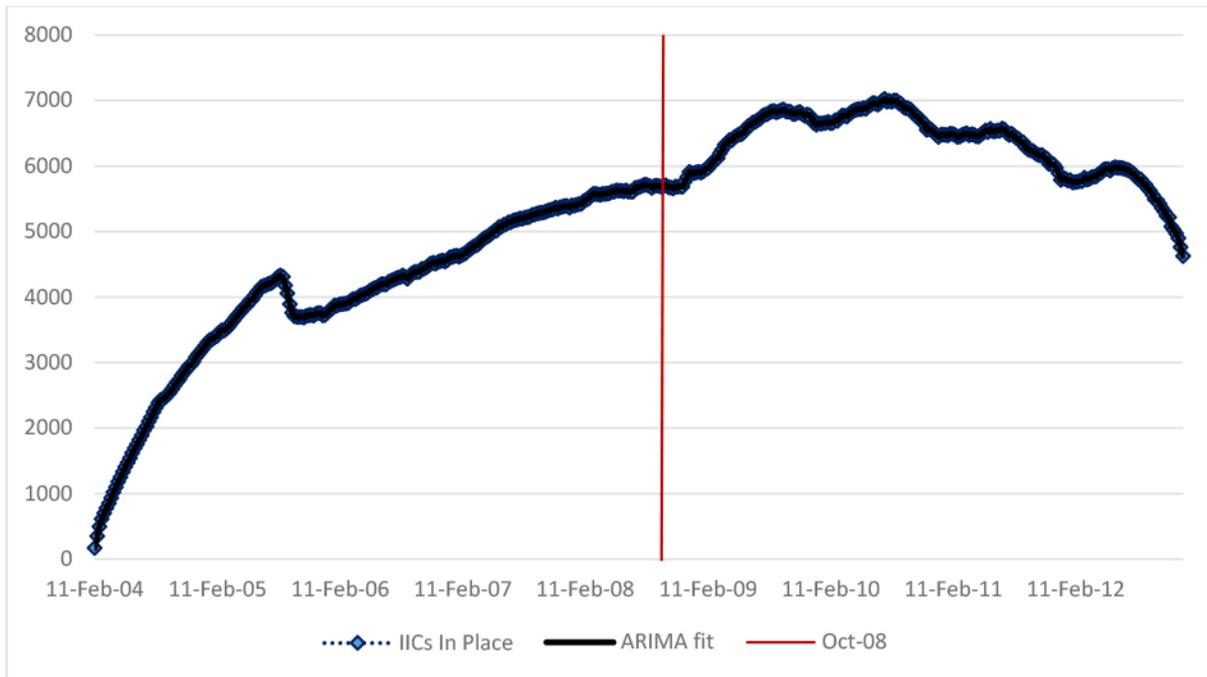


Figure 8. Florida: Number of Interlocks-in-Place Before and After the Intervention.

Additional analyses using less conservative model fitting techniques (which run the risk of post-hoc hypothesis-fitting) resulted in only a slight improvement in effect size but which were still not statistically significant. This raises the question of why there were significant increases in interlock installations but not interlocks-in-place. One reason may be that the intervention resulted in an increase in first offenders in the population. The fact that these were high-BAC offenders notwithstanding, as first offenders, they were likely to have had shorter mandated interlock periods and to have been more likely to comply with restrictions—both characteristics resulting in shorter times on the interlock and a smaller contribution to an increase interlocks-in-place than might otherwise have been the case. Table 4 shows modal interlock assignment lengths by number of prior offenses.

Table 4. Modal Interlock Assignment Lengths by Number of Prior Offenses.

	4-6 months	9-12 months	18 months or longer^a
First offenders	82.9%	11.4%	5.7%
Second offenders	14.9%	63.5%	21.6%
Third+ offenders	4.4%	25.5%	70.1%

^aGenerally 24 or 36 months.

The apparent short-term rise in numbers of interlocks-in-place after the October 2008 law and subsequent decline afterwards may be explained by another component of the October 2008 law: extensions of interlock sentence lengths. Beginning in October 2008, subjects who commit three (or more) startup violations must submit to a treatment program, and the interlock may not be removed until successful completion of this program, which also includes the stipulation that they must be free of any startup attempts above .05 BAC before interlock removal. This

temporary delay of removal dates would produce more numbers of currently installed interlocks. We found in Voas et al. (2016) that there was an apparent learning effect—and possibly also a preemptive effect—because repeat violators eventually altered their behavior, got back into the removal queue, and, in some cases, may have been prevented from committing their third violation (resulting in the graph’s eventual tapering and decline to pre-intervention levels).

Lack-of-Use Data

We analyzed lack-of-use in terms of raw numbers of reported lack-of-use (Figure 9) and as a proportion of interlocks-in-use (Figure 10). The analysis used lack-of-use data from January 2007 to March 2012. The interlock vendor notifies the DHSMV of non-use of interlock vehicles. After notification, the DHSMV writes a letter to the offender. The data used for this analysis consisted of dates that letters were sent by the DHSMV to offenders to inform them of the lack-of-use report; therefore, they are removed somewhat in time from the data download in which the vendor identified the lack-of-use. The date of the letter is generally about 30 days after the report from the vendor to the DHSMV; we identified the entire prior 30-day period for that person as a low-use month. (These assumptions will contain some error, but presumably these errors would equal out across time, so the intervention should be affected by our assumptions the same way.)

Raw Number of Lack-of-Use Reports

The weekly counts of lack-of-use data were highly variable, so we opted to aggregate the weekly reports to triweekly. This cuts our data points by two-thirds, but provides a more amenable series, as shown in Figure 9.

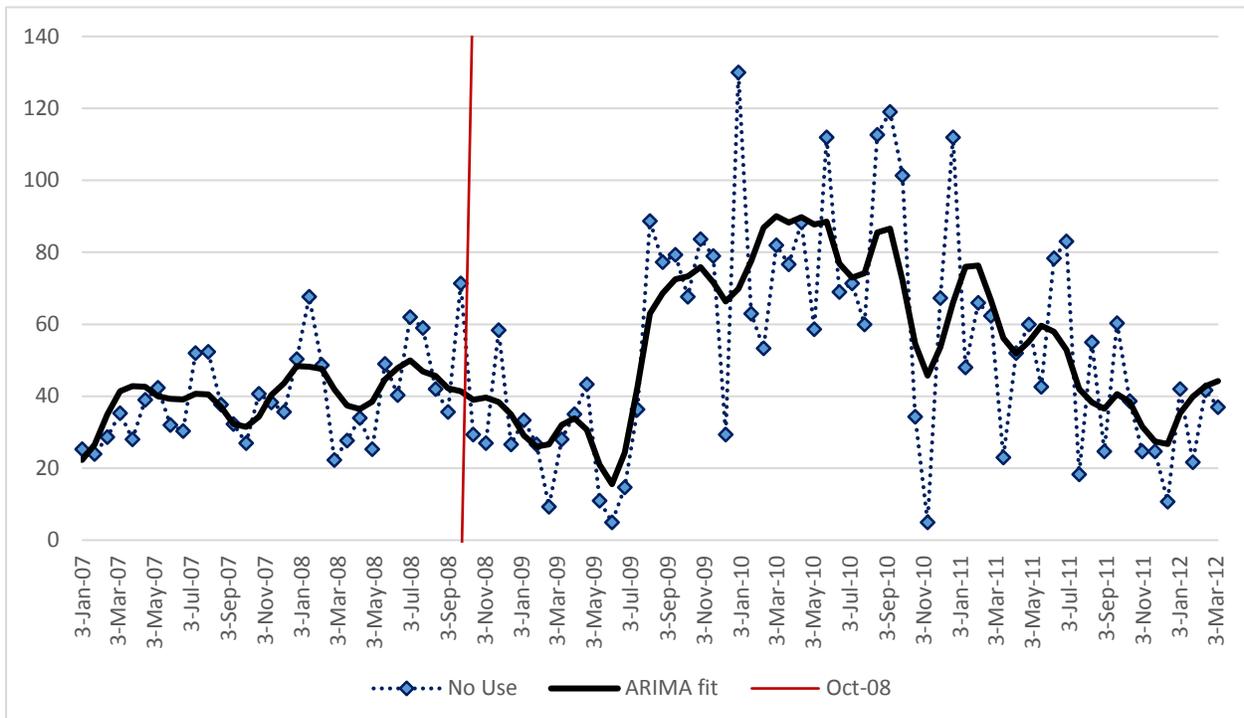


Figure 9. Florida: Lack-of-use Data, Triweekly Series.

The results of the ARIMA suggest no significant change in lack-of-use pre-post intervention. Depending on the model used, the range of effect size corresponding to the new law was implemented is as high as a +9.1 percent increase in lack-of-use ($t = 0.42$; $p = .68$) or as low as a -43 percent decrease ($t = 1.48$; $p = .14$). Although the range is very large, neither is significantly different from zero.

Another approach we took was to take the Florida interlocks-in-place series (Figure 8) and subtract out the new data on lack-of-use to create a series representing interlocks installed and in use. But since the lack-of-use numbers are so small by comparison, the resulting series (Figure 10) looks much like the series for raw numbers of Florida interlocks-in-place (Figure 8).

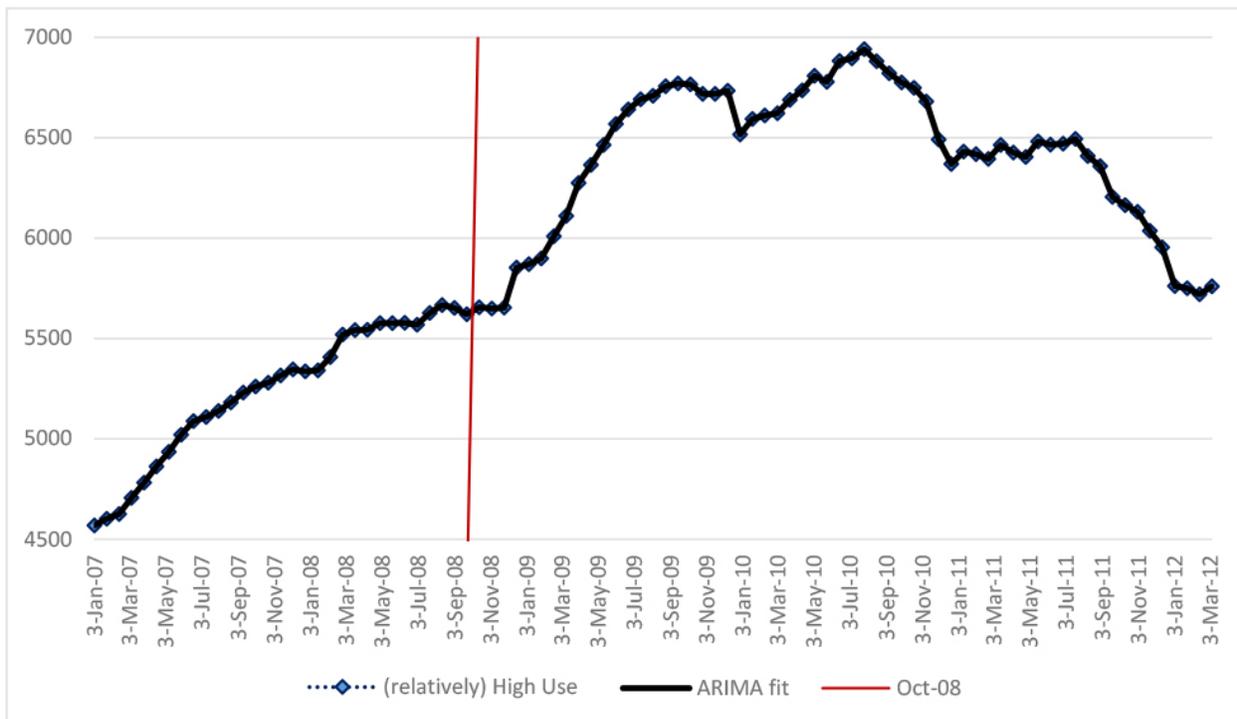


Figure 10. Florida: Interlocks-in-Place and in Use, Triweekly Series.

This was done using the triweekly aggregation window. Again, the ARIMA showed no statistically significant pre-post law difference (+0.5%; $t = 0.58$; $p = .56$).

Lack-of-use as a Proportion of Interlocks-in-Place

The final analysis examined the proportion of the numbers of interlocks identified as lack-of-use over the numbers of interlocks in place. These proportions were less variable than the raw numbers of interlocks identified as lack-of-use and were more suitable for ARIMA. But again, there was no statistically significant pre-post law difference. (+5.21%; $t = 0.345$; $p = .731$). See Figure 11.

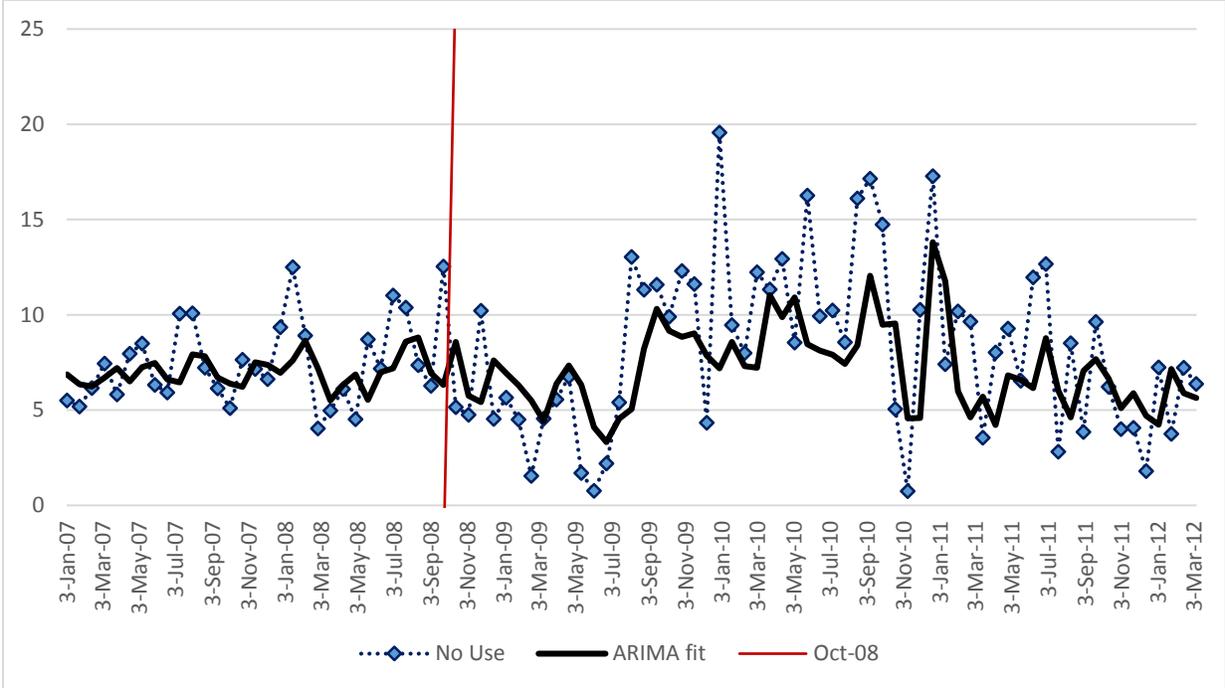


Figure 11. Florida: Lack-of-use as a Proportion of Currently Installed.

Conclusion

The analysis of the Florida data found that after the change in the law, there were statistically significant increases of 21.8 percent in DUI offenders mandated to install interlocks, of 12.3 percent of offenders who installed interlocks, of 69 percent of first offenders mandated to install interlocks, and of 27.8 percent of first offenders who installed interlocks.

Case Study 2: West Virginia

Program History, Including Legislation

The interlock program in West Virginia is administered by the West Virginia DMV. The program has staff whose sole responsibility is to administer the program, which includes monitoring offenders' interlock log data via the interlock providers' websites.

How long an offender is enrolled in the interlock program is based on the severity of the original offense (e.g., child endangerment and crashes causing injury or death increase the required length) and on the number of offenses in the past 10 years. For example, a driver with a first offense of aggravated DUI (BAC of .15 g/dL or higher) is required to participate for a minimum of 10.5 months under the most recent law (SB 434 enacted in June 2014); however, a driver with an aggravated DUI offense who has a prior offense in the immediately preceding 10 years is required to participate for 3 years. Each additional offense within the preceding 10 years will increase the participation period by 1 year. Offenders may be assigned additional time on the program depending on the type, number, and severity of program violations. Interlock tests resulting in positive breath alcohol readings result in violations using a sliding scale, in which higher alcohol readings have higher "demerit" points and more accumulated demerits result in longer time on the program. In the case of severe violations, the time spent in the program may be reset to zero requiring the offender to start again. Certain violations (e.g., tampering/circumvention, driving a non-interlock-equipped vehicle, failure to participate in classes/treatment, or subsequent DUI) result in automatic removal from the program. Program participants are also required to take safety classes and may be required to participate in treatment. In some cases, WV DMV staff require offenders to use interlock devices with photo identification technology.

A brief history of the West Virginia interlock program is described as follows.

- July 1993—The interlock program was initially a voluntary program. This program was under the sole purview of the West Virginia DMV and available only to offenders whose arrests involved alcohol. Drug-only offenders were prohibited.
- July 2005—House Bill 2444 required interlocks for repeat offenders. This was done to put West Virginia in compliance with a Federal rule mandating an interlock law for repeat DUI offenders. The program remained voluntary for first offenders. It was also in 2005 that the demerit system was instituted, which created a form of compliance-based removal of interlocks. The effectiveness of this system is partially a function of the quality of monitoring. Monitoring systems have improved over the years, improving the ability to detect violations and assess demerits has improved.
- June 2008—SB 535 created the offense of aggravated DUI (BAC of .15 g/dL and above), which requires mandatory interlock participation. It also allowed for reduced revocation for regular first-offense DUI (BAC of less than .15 g/dL) for voluntarily interlock from 30 days to 15 days.
- June 2010—SB 186 allowed the expungement of criminal charges for first-offense, low-BAC offenders who completed an ignition interlock program. The criminal conviction stays on the driving record and is used to identify prior offenses for 10 years.

- June 2014—SB 434 eliminated the hard revocation period for a DUI offender who (1) applies to the interlock program prior to the effective date of the revocation; (2) is accepted into the program; (3) successfully completes all terms of the program for a period equal to the minimum period for the use of the ignition interlock device plus any applicable minimum revocation period; and (4) waives the right to an administrative hearing. This is essentially an enticement to offenders to install interlocks to avoid hard revocation. State officials believe that the rural nature of the State increases the need to drive and therefore the willingness to participate in the program to retain a valid driver’s license.

Methodology

Description of the Interlock Data

DMV Data—Three sets of files were acquired from the DMV for use in our analyses. Two of these contained de-identified information on individual offenders assigned to the interlock program. The first of the two contained de-identified information on offenders who had completed the program, and the second contained de-identified information on offenders still in the program with installed interlocks. These files represented the offenders’ status at the time the data were pulled. Researchers initially obtained data pulled from DMV live records on January 19, 2016. Updated data were later sent containing records current to July 31, 2017. Both the files on completed offenders and on current offenders contained the following fields.

- Date of birth of offender
- Gender of offender
- Date of installation
- Date of removal
- Interlock provider
- DMV file number (This a unique number used by the DMV to identify drivers, but different than the driver’s license number. The DMV maintains the crosswalk information necessary to link the file number to an individual. Crosswalk information was not available to researchers.)

In addition to the data from individual offenders’ records, the DMV provided reports that included monthly totals of the numbers of installations and removals from July 2007 to June 2017. They also provided reports containing numbers of annual DUI arrests from 2011 to 2016.

Vendor Data—Additional data were requested and received from the two interlock vendors in West Virginia. Data from both vendors contained some anomalous data around the time they began doing business in West Virginia. These data were removed. Data from Vendor 1 spanned the period from August 2011 to February 2017. Data from Vendor 2 began in September 2000 and extended to January 2017. Each vendor provided a spreadsheet file containing monthly counts for:

- Total devices “in use” (in place on vehicles);
- New installations;

- Removals;
- Number of vehicles with fewer than 30 vehicle-starts per distinct client; and,
- Number of vehicles with greater than or equal to 30 vehicle-starts per distinct client.

We used this data to create monthly values for the proportion of lack-of-use of interlocks—that is, the number of vehicles with fewer than 30 starts divided by number of interlocks in use as indicated in vendor data. The two DMV files containing data for individual offenders were imported into SPSS and merged into one file. Each case contained data for one offender. The file included people who were still on the interlock program. For them, the interlock removal date was extrapolated as a projected date in the future, based upon the beginning of their interlock assignment.

The purpose of acquiring these data was to determine numbers of new installations and numbers of interlocks-in-place over time. Because the DMV files did not include numbers of interlocks-in-place, it was necessary to calculate it. This required aggregating total numbers of installations and removals by week over the period represented by cases in the files. Using the resulting files, containing total installations and removals by week, we calculated a running total of interlocks-in-place for each week by adding the previous week's running total to the new installations for that week, then subtracting the number of interlocks removed that week.

Data based on monthly summary reports were obtained to overcome shortcomings in the offender data files. As with the data from individual offenders, it was necessary to create counts of interlocks-in-place from running totals of installations minus removals.

Analyses

Time series analyses on the effects of strategies in West Virginia were performed using the same basic approaches as used for the Florida case study, though models differed for the different data set. These ARIMA intervention analyses are the standard method for measuring the impact of a law or policy change on measure. For West Virginia, which began accumulating cases in roughly July 2005, there were separate interventions in June 2008, June 2010, and June 2014. Not all law changes could be tested as separate intervention points in each ARIMA model (depending on the number of cases available as a baseline pre-intervention change), but when these could be incorporated, they were included together in the same model, to avoid conflating the effects of one law with the effects of an earlier or later law.

Results

Interlock Use

Installations

We performed analyses of new installations as recorded in the West Virginia DMV data. We had installation data in two forms: monthly totals and dates of installations of individual offenders. The latter allowed us to create counts of installations on a weekly basis. These provided more measures of installations and therefore greater statistical power than monthly installation data. In some cases, weekly data were analyzed for biweekly periods, because there was less variance between periods). Both weekly and monthly data were analyzed; however, the analyses of weekly data were ultimately deemed more suitable, with findings from monthly data providing

no additional value to the analysis of new installations. Analyses of monthly installation data will therefore not be presented in this report.

Because the data on installations appeared to be relatively accurate going back several years, we attempted to use it to analyze not just the effects the 2014 law that is of prime interest in this study, but also to analyze a prior law implemented in 2010. We did not attempt to look for an increase in interlock use following the law that was implemented in June 2008. This is because there were very few interlocks prior to that law, such that it was not possible to conduct an analysis comparing post-June 2008 interlock use with what was essentially zero interlock use.

Figure 12 is based on using the key portion of the biweekly series, with the June 2010 intervention marked by a light vertical line and the June 2014 intervention marked with a heavier vertical line. A change after the June 2010 law does not appear until after a 2-month lag. The results of ARIMA indicated a 242 percent increase in installations following the implementation of the 2010 law after a 2-month lag ($b = 1.229$; $t = 8.33$; $p < .001$) and a 40 percent increase following the 2014 law ($b = .290$; $t = 2.33$; $p = .021$).

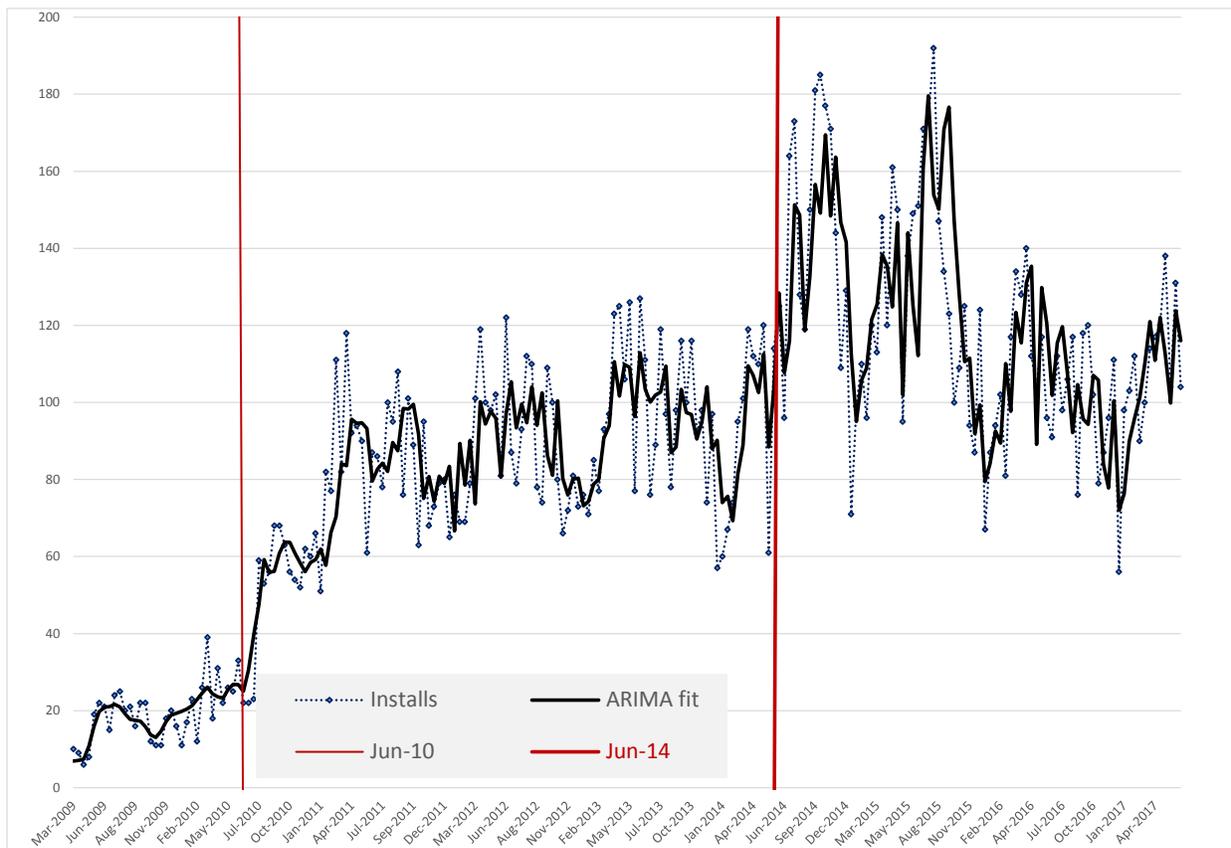


Figure 12. West Virginia: Number of Interlock Installations.

Based on information from officials of the West Virginia DMV, the 2-month delay after the 2010 law was implemented is due to:

- Four to 10 days of administrative preparation time after the arrest to send out notification of revocation, and,

- Four days for the notice to get to drivers by mail, and,
- Up to 30 days for drivers to respond, and,
- 15 days they had to be revoked before they could get the interlock.

The 2-month delay after the 2010 law would *not* be evident after the 2014 law, as the purpose of the latter law was to eliminate the waiting period and give people the opportunity to bypass any revocation by getting the interlock more quickly. The 2014 law would still involve two weeks of administrative preparation and letters going through the mail, but interlocks can start after that for those who want it.

It is important to understand that, while the 2014 law was not officially retroactive, when the law first went into effect the West Virginia DMV offered the program to anyone who was still pending revocation, even if they were arrested before the law went into effect. The West Virginia DMV was especially interested in offering the program to those with pending hearings, because part of its purpose was to cut down on hearings by offering interlocks in exchange for foregoing hearings. The new program was offered retroactively from June to mid-October 2014. This would explain a reduction in new interlocks after October 2014. West Virginia made the same offer again from the beginning of June 2015 to the beginning of August. This could have resulted in another increase during that time and decrease afterward.

Interlocks-in-Place

Interlocks-in-place data were created from data supplied by West Virginia DMV and consist of running counts of numbers of interlocks installed minus numbers of interlocks removed. Because these data do not go back to the beginning of the program, they do not include interlocks already installed before the beginning of the data file. This is not a problem because we used the numbers to look at changes in numbers of interlocks-in-place over time, not to understand the number of interlocks-in-place at any one time. The number of interlocks-in-place prior to the beginning of the data would create an offset between the number of interlocks-in-place and our calculated number, but that offset would remain constant over time and would not inhibit our ability to detect changes.

A larger problem stems from the fact that West Virginia DMV data for individual offenders appeared to have anomalous data for interlock removals prior to the summer of 2011. There were very few data entries for removals prior to the spring of 2011, even though many offenders should have completed their interlock periods and had the interlocks removed by then. This may have been a result of a conversion of old data files to a newer format leading to a loss of records of the numbers of removals before the spring of 2011. Because the interlocks-in-place data were first calculated using the removal data, the anomalies in the removal data for individual offenders rendered the interlocks-in-place data questionable. The research team opted to address this issue in two ways. The first was to examine the data provided by the DMV containing monthly totals of installations and removals. Removal data in these files were reported to have been created and recorded each month and were not susceptible to problems caused by converting formats. As noted previously, a disadvantage to analyzing monthly counts is that they do not provide as much statistical power as weekly counts. Using these data, analysis of interlocks-in-place for the July

2010 intervention showed a non-significant change of less than 1 percent decrease in the numbers of interlocks in place after the law ($b = .010, t = 0.23, p = .821$.) After the July 2014 intervention, there was a non-significant change of 2.4 percent ($b = .024, t = 0.55, p = .583$ (see Figure 13).

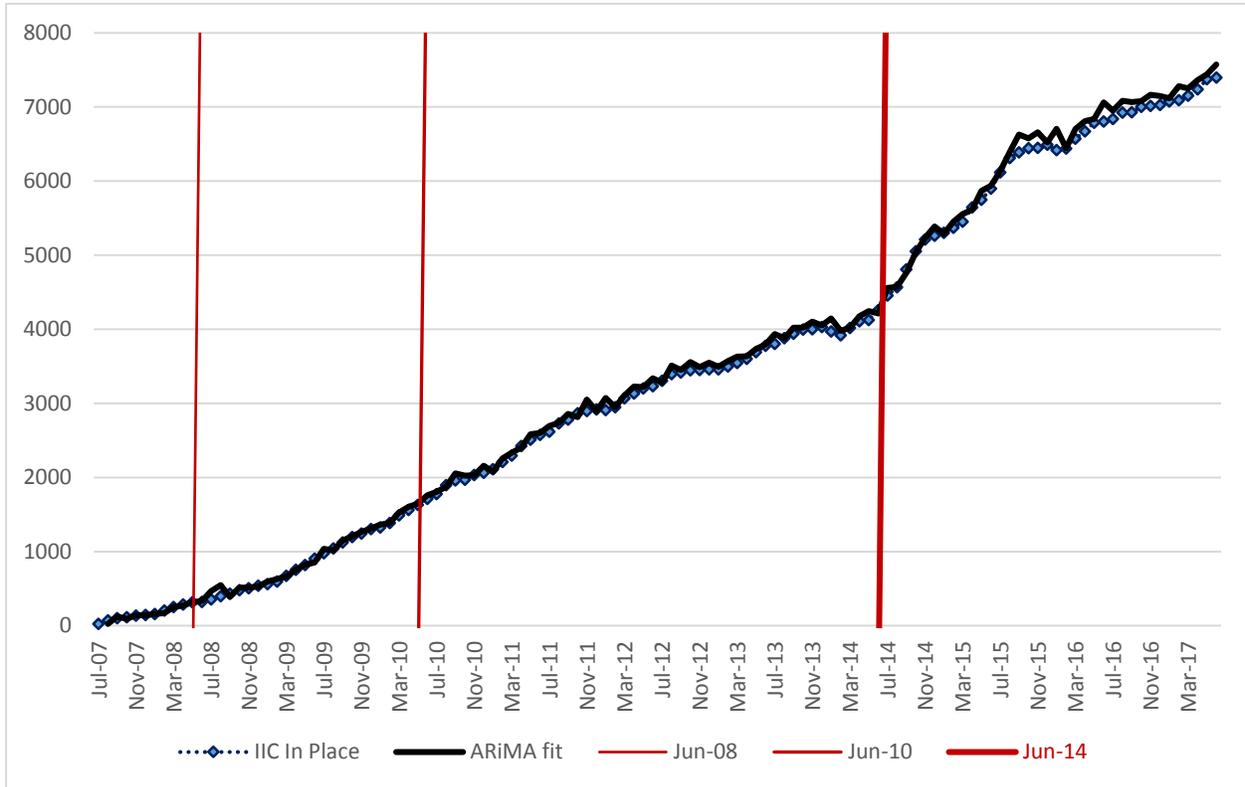


Figure 13. West Virginia: Interlocks-in-Place From Monthly Report Data.

The second approach to analyzing interlocks-in-place was to use the weekly data for individual offenders beginning in the summer of 2011 at the point when the removal data appear more reasonable. This provided a series that began 3 years before the June 2014 implementation of the law that is the primary focus of this study. Figure 14 seems to show a steeper upward trend in interlocks-in-place following the intervention, which might suggest an increase due to the intervention; however, time series analysis using ARIMA intervention models did not show any significant effect at the intervention point ($t = 0.94; p = .347$). Two alternative forms of modelling the intervention did yield significant results. A change in trend (i.e., continually ramping up) showed a significant impact, $t = 2.40, p = .017$. Unfortunately, quantifying the degree or amount of the intervention is not straightforward when modelling this way. A period of temporary ramping up to a plateaued effect 1 year out showed a significant impact, $t = 4.64, p < .001$. This intervention function may be the most accurate representation of what happened; however, this approach is open to criticism of post hoc modelling—that is, creating a function to fit the data. We would generally avoid doing this unless there was a procedural or policy reason to defend it.

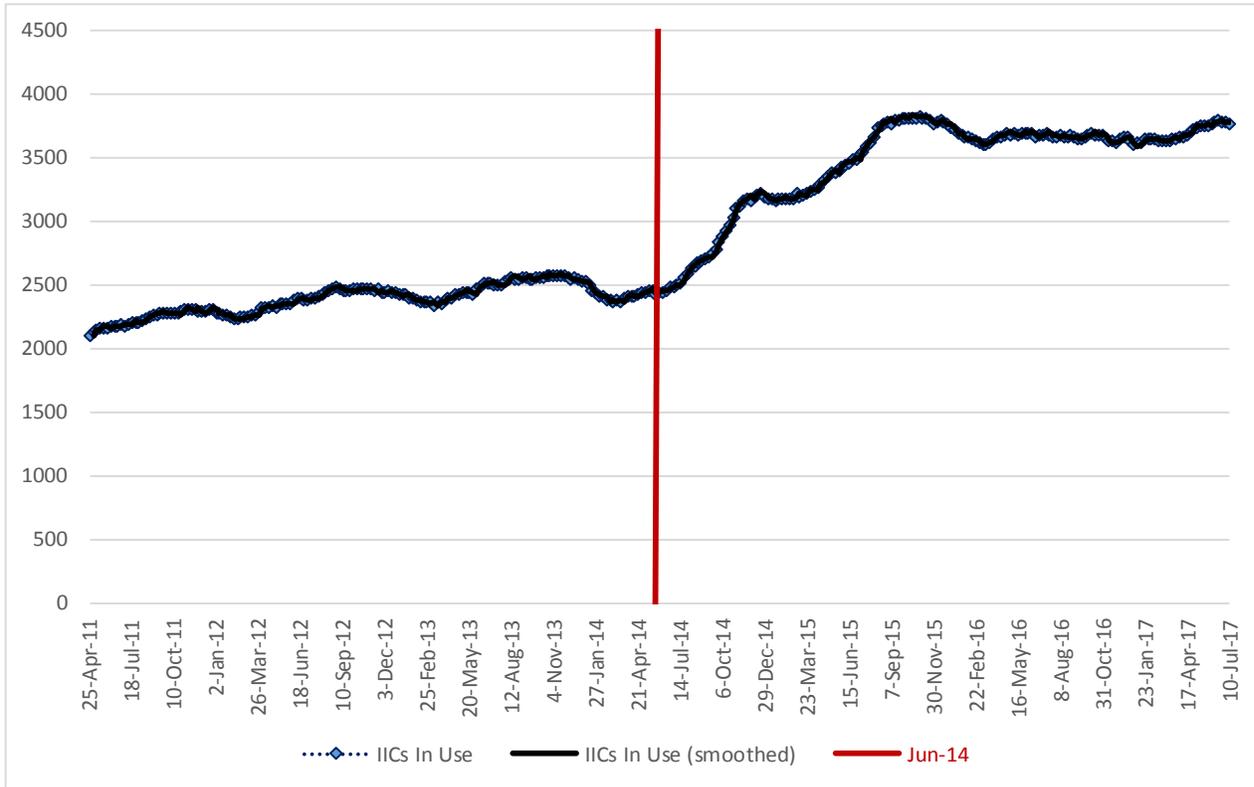


Figure 14. West Virginia: Biweekly Analysis of Interlocks-in-Place.

Given the limits of the West Virginia interlocks-in-place data (i.e., the limited resolution of the monthly data and the limited duration of the weekly data), the numbers of new installations per month may be a better measure of growth in interlock use than the calculated numbers of interlocks-in-place. A potential problem with this approach is that it does not allow us to understand the possible effects of West Virginia’s demerit system, which extends time on the interlock for offenders who violate requirements of the program. However, because the demerit program has been in place since 2005, its effects on interlock use have likely remained constant throughout the period being studied in this project.

Installations as a Proportion of Those Eligible

As noted earlier, data were not available to compute weekly or monthly DUI arrests, so it was not possible to perform time series analyses of the numbers of installations as a proportion of the numbers of offenders eligible for installation. Annual numbers of installations as a proportion of DUI arrests suggest an increase in 2014. Table 6 shows changes in interlock installations as a proportion of DUI arrests in West Virginia, 2011 through 2016.

Table 5. West Virginia: Interlock Installations as a Proportion of DUI Arrests, 2011-2016.

	DUI Arrests	Installed	
		N	%
2011	9,412	2755	29.3%
2012	9,874	2864	29.0%
2013	10,182	3038	29.8%
2014	9,363	3694	39.5%
2015	9,055	3976	43.9%
2016	8,349	3206	38.4%

Lack-of-Use Data

While some legal strategies to increase interlock use might result in more interlocks being installed, they do not ensure that interlocks are used by the offenders. For each of two vendors in West Virginia, we created the monthly proportion of cases of low use out of all interlock clients (interlock clients with fewer than 30 starts per reporting period divided by interlocks-in-place as recorded in vendor data). Across both vendors, these proportions ranged from 0 to 15 percent of interlock clients in a given month, with a mean of 4 percent. Even though the numbers of lack-of-use installs were reported to be determined in the same manner by both vendors, the proportions we calculated with data from one vendor were generally higher than for the other. This, coupled with the fact that one vendor provided interlocks in the State later than the other, suggests that the lack-of-use analysis would be better if the data for each was kept separate.

Figure 15 shows proportions of lack-of-use in Vendor 1 data from August 2011 to February 2017. The vertical line shows the law in June 2014. ARIMA analyses showed a non-significant increase of 9.6 percent in proportion of lack-of-use following the 2014 intervention.

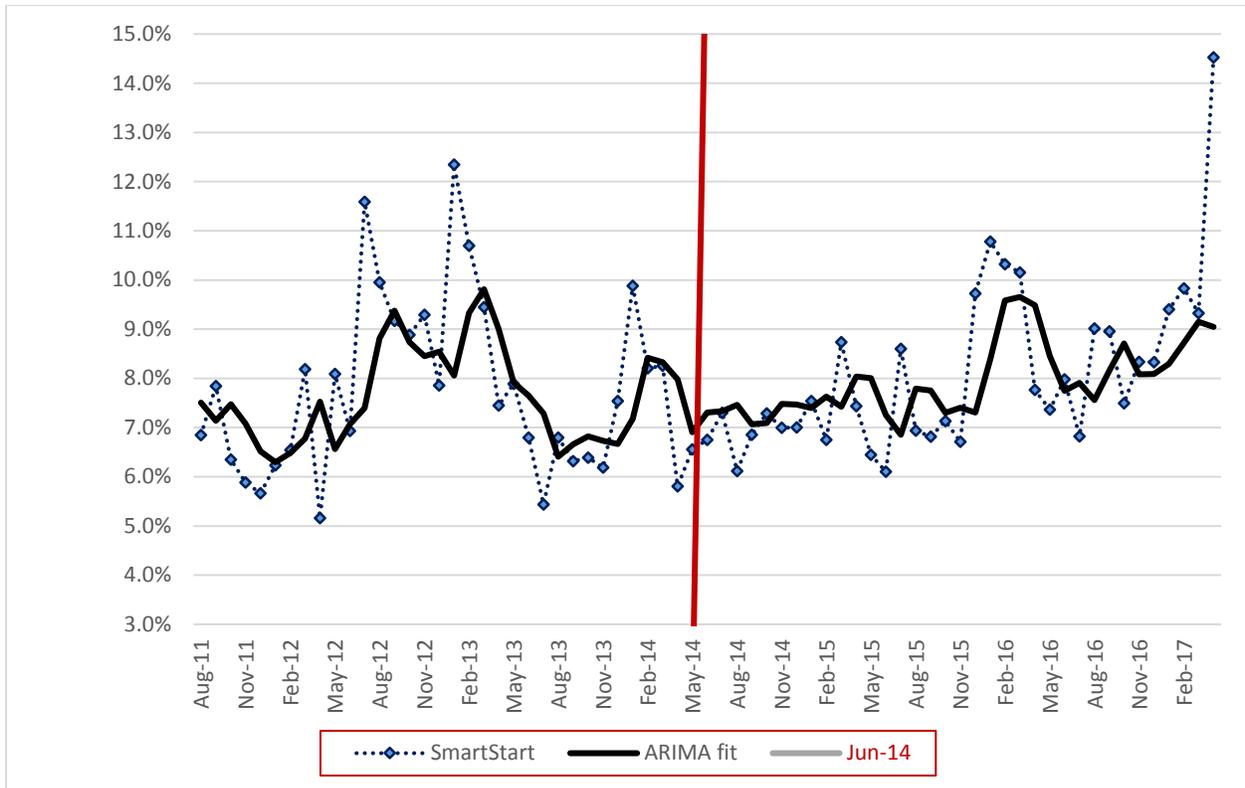


Figure 15. West Virginia: Vendor 1 Lack-of-Use Data.

Figure 16 shows proportions of lack-of-use in Vendor 2 data from September 2000 to June 2017. We saw no evidence of a significant increase in proportions of interlock users who were identified as low- or non-users after the June 2014 law (SB 434) that is the primary focus of this study. We also did not see a change in lack-of-use following the implementation of SB 186 in June 2010. However, we did see a significant increase in lack-of-use following House Bill 2444 in 2005, which required interlocks for repeat offenders. We also saw a reduction in lack-of-use following SB 353 in June 2008, which required interlocks for high-BAC offenders and reduced revocation periods for first offenders who voluntarily installed interlocks.

We theorize that the increase in 2005 is due to a change from all-volunteer interlock offenders, who are presumably relatively compliant, to a population containing largely repeat offenders, who were likely less compliant. It seems reasonable to suggest that the reduction in lack-of-use following SB 535 may be due to an influx of (relatively compliant) first offenders. It has also been suggested by a vendor representative that the State became more vigilant in monitoring for lack-of-use around that time. These results suggest that lack-of-use ratios can be sensitive to changes in the population of interlock users because of new laws or policies. It also shows that the interventions in 2010 and 2014 did not result in significant increases in lack-of-use.

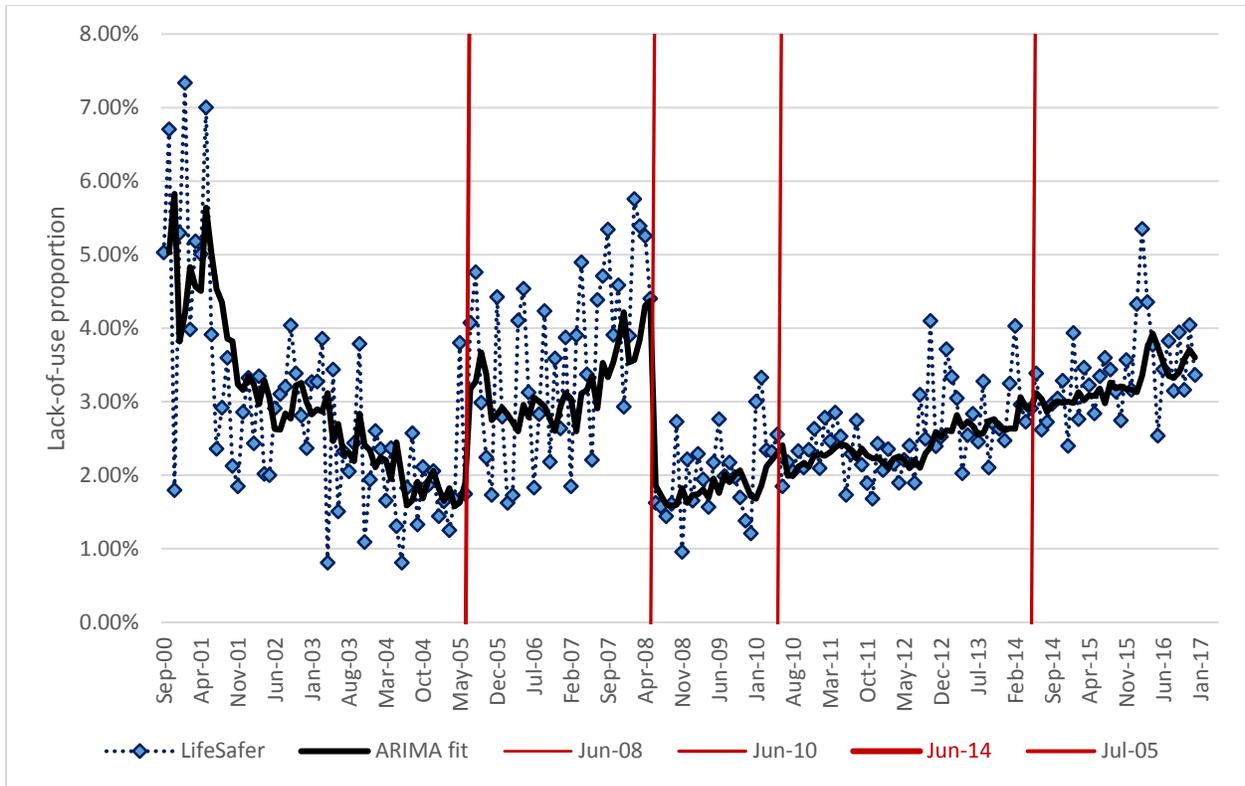


Figure 16. West Virginia: Vendor 2 Lack-of-Use Data.

Table 6 shows the results of time series analyses for the months in which laws were implemented during the times that each vendor was operating in West Virginia. Rows in which numbers are in italics represent statistically non-significant results.

Table 6. West Virginia: Lack-of-Use Among Vendor 1 and Vendor 2 Clients.

	Effect Size	Estimates	Std Error	t	Approx Sig
Vendor 1					
June 2014	9.6%	0.09161	0.10055	0.911	0.366
Vendor 2					
July 2005	61.7%	0.48034	0.17666	2.719	0.007
June 2008	-60.3%	-0.92491	0.17668	-5.235	<.0001
June 2010	0.5%	0.00465	0.17668	0.026	0.979
June 2014	6.5%	0.06289	0.17667	0.356	0.722

Lessons Learned

West Virginia officials found that modifying their administrative rules provided a flexible and effective way to address problems with the interlock program. They created administrative ways to handle offenders identified as not using interlock-equipped vehicles.

Officials estimated that 14 to 20 percent of those mandated to use interlocks are residents of other, generally neighboring, States. West Virginia works with two vendors that have a presence in most States made it possible to assign out-of-State offenders to the program. This was facilitated by adding language into the rule that allowed the State to accept program completion from other jurisdictions with similar standards. These are most likely to be the adjacent States of Virginia or Maryland.

Conclusion

Officials noted the benefit of getting offenders assigned to interlocks as soon as possible, rather than insisting on a hard revocation period. Especially for offenders who may have problems with alcohol, it may be better for them to get into a system that will monitor their alcohol use and assign treatment and other interventions accordingly. A perceived benefit of the June 2014 law (SB 434) has been that the process of getting offenders into the system and having them exposed to all its elements has been accelerated. Part of this acceleration is because offenders bypass the hard revocation and part is due to eliminating a hearing process that can be quite long.

While one of the purposes of SB 434 was to increase the number of offenders on interlock, it was also intended to reduce the number (and attendant time and costs) of administrative hearings, by allowing offenders to bypass a hard revocation if they waive the right to the hearing and install interlocks. In the face of a hard revocation, many offenders responded before SB 434 by asking for hearings and getting continuances. Though it was rare to avoid administrative revocation as the result of the hearing, offenders were buying time by using the hearing procedure to delay revocation. Once offenders were offered the ability to bypass revocation, there was no need to use the hearing process as a delaying tactic. Officials estimated that in the year following the law, the number of hearings had dropped by about 50 percent.

Summary

The findings revealed statistically significant increases in interlock installations following changes in DUI law in both Florida and West Virginia that expanded the types of DUI offenses, and that mandated or permitted (as an alternative sanction) the use of interlocks (and maintenance of driving privileges). These results, while not surprising, are valuable nonetheless considering that, historically, many offenders had avoided enrolling in interlock programs. The analyses show that barriers to interlock use arose if enrolling in an interlock program is conditional. For example, offenders may have to pay past fines or child support to be eligible for interlocks. Finally, the study highlights the importance of interlock data systems for States to track trends in interlock use and evaluation of interlock programs.

Florida

In Florida significant post-law increases were seen in the numbers of all DUI offenders who were mandated to install interlocks (21.8%); the numbers of all offenders who had installed interlocks (12.3%); the numbers of first offenders mandated to install interlocks (69%); and, the numbers of first offenders who had installed interlocks (27.8%). Analysis of interlocks-in-place failed to show any significant change post-intervention. This may have been because an influx of new interlock users to the overall pool of users represented a relatively small change to the number of users. It may also have been related to the fact that the law was aimed at a class of first offenders who may have had shorter times on the interlock, which would have contributed less to the number of interlocks-in-place.

Lack-of-use in Florida was examined in terms of the count of reports of low use, the count of interlocks installed and in use (as calculated from interlocks-in-place minus reported lack-of-use), and as a proportion of interlocks-in-place. None of these showed a significant change in low/lack-of-use after the 2008 law intervention.

West Virginia

In West Virginia the results of ARIMA indicated a 242 percent increase in installations following the implementation of SB 286 in 2010 ($b=1.229$; $t=8.33$; $p<.001$) and a 60 percent increase following the implementation of SB 434 in 2014 ($b=0.468$; $t=3.28$; $p<.001$). Regarding interlocks-in-place, we did not obtain reliable data to evaluate the effects of the 2010 law on interlocks-in-place. No significant increase in interlocks-in-place was seen after implementation of the 2014 law. This may be due to the quality of the data on interlock removals used to calculate interlocks-in-place or, interlocks-in-place may have proved to be a relatively insensitive measure of changes in interlock use.

In West Virginia, we examined changes in lack-of-use in data from two vendors. Both vendors' data allowed examination of the effects of SB 434 in June 2014; one vendor's data allowed us to look at the effects of SB 535 in June 2008 and SB 186 in June 2010. The only significant effect seen was after the 2008 law, which resulted in a 60.3 percent reduction in lack-of-use. This may be due to an influx of first offenders entering a program that had been previously been voluntary for first offenders but mandatory for multiple offenders.

West Virginia's 2014 law, SB 434, was expected to increase the use of interlocks, but another primary goal behind it was to decrease the misuse of the administrative hearing process by offenders who attempted to use it to delay license revocation. Requests for hearings reportedly

dropped about 50 percent after the law was implemented. Officials believed it also reduced requests for continuances in court cases, which lowered workloads for courts and law enforcement agencies.

Summary

Where data on interlock installations were available and programs were sufficiently mature to provide sufficient pre-intervention data, strategies that would be expected to increase interlock use in Florida and West Virginia resulted in significant increases in interlock installations. The variable “interlocks-in-place” did not show significant changes in interlock usage in either State. In West Virginia, this may be because the interlocks-in-place data were limited (to either monthly counts or weekly counts over a limited period). In Florida it may reflect the fact that offenders subject to the new law have the interlock for a relatively short time. In either State, it is possible that interlocks-in-place are relatively insensitive to changes in interlock use, due to the buffering effect of the pool of installed interlocks.

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